Heating and Ventilating

For Engineers and Contractors Controlling the Design, Specification, Installation and Maintenance of Heating, Ventilating and Air Conditioning

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CONTENTS

Cover ..... *Courtesy Sturtevant Cooling and Air Conditioning Corporation*
Design, Installation, and Operation of an Institutional Heating Plant ..... *Carl J. Eckhardt, Jr.* 17
Notes on Forced Warm-Air Heating Layouts ..... *J. E. Maynard* 21
Getting Down to Fundamentals. 1—Heat Quantities, Their Nature and Direction of Flow 23
Air Blows Dirt from Heating System Risers 26
A Method of Burning Anthracite Screenings ..... *Robinson V. Frost* 27
MODERNIZING SECTION 28-36
FHA May Insure Loans for Commercial Modernizing 28
Modernizing a Brewery Service Plant ..... *R. W. Noland* 29
On the Firing Line 31
Find the Facts and You Find Modernizing 33
Copper Patch Welding of Cracked Boiler Sections 36
Five Unusual Theater Air Conditioning Installations 37
Cooling with Air from Tunnels 41
88.8% of Philadelphia Residential Structures Have Central Heat 42
NRA Code Activities Quiet 44

DEPARTMENTS

Reference Data, 51 and 52, Pipe and Pipe Fittings—3 ..... Opposite 26
Abstracts 45
Editorials 49
News of the Month 50
Picture Paragraphs 52
With the Manufacturers 57
New Equipment 62
Degree-Days for February, 1935 68
The Weather for February, 1935 70
New Catalogs 74

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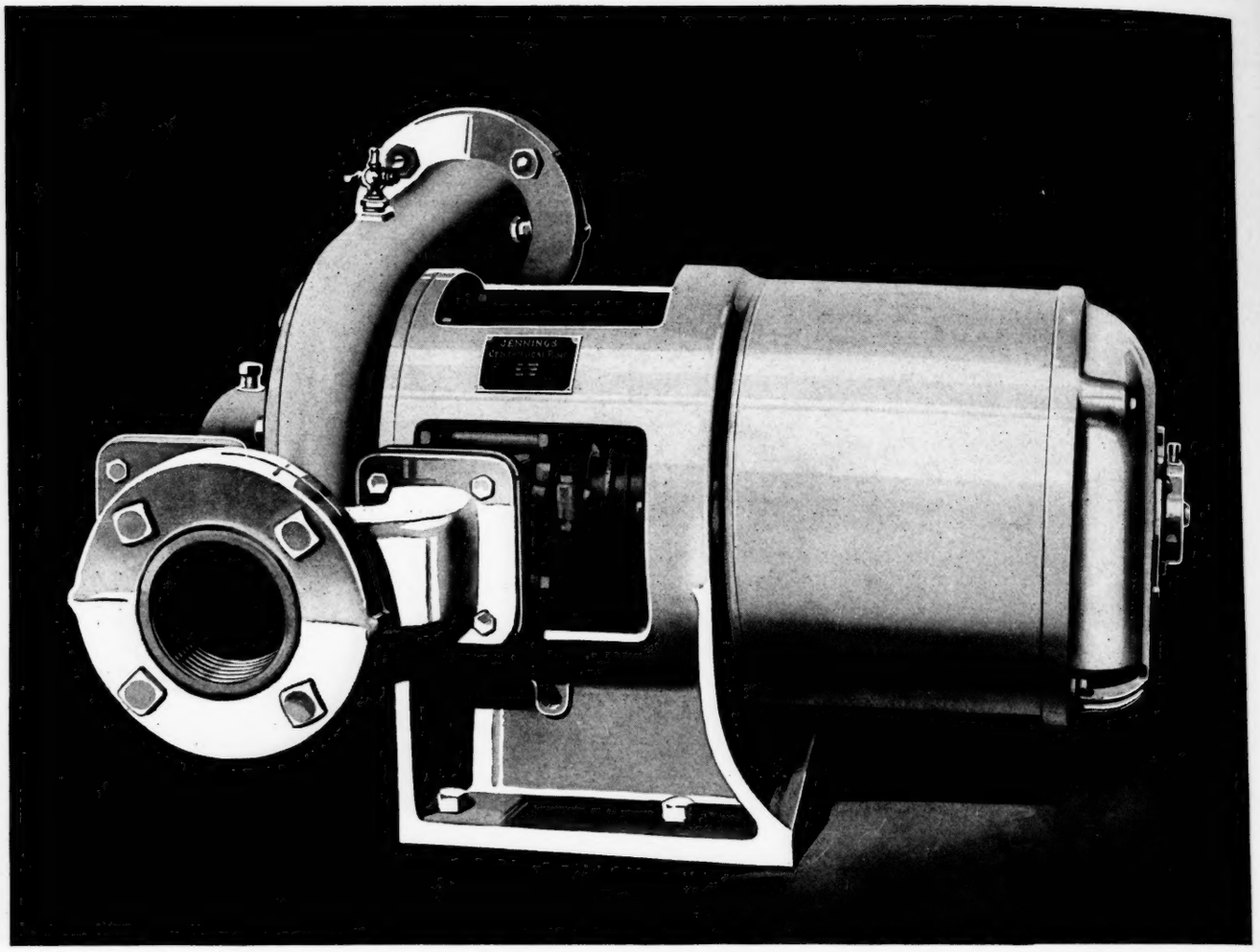

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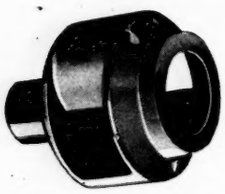

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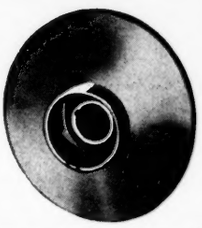

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Fig. 1. Campus of the University of Texas, from nearby hill, as it is today.

Design, Installation, and Operation of an Institutional Heating Plant

1. Building Expansion Program of the University of Texas

By CARL J. ECKHARDT, Jr.†

Planning, constructing, and operating the power plant, heating systems, and the interconnecting distribution systems for a large number of diversified institutional buildings is an engineering problem of no small magnitude. This article is the first of a series dealing with the building program of the University of Texas which called for the erection of 16 buildings in a period of 9 years. The development of the physical plant for serving these buildings involved a considerable amount of deliberative planning in order to provide for future needs and changing conditions. One of the major requirements of such a plant is its economy of operation, an objective which this system has attained. Unit steam costs, as will be shown later, are steadily falling.

THE University of Texas, a state institution, was founded a little over 50 years ago, in 1883. In the intervening period it has been developed and improved until this originally humble school is one of 30 American and Canadian universities honored by membership in the Association of American Universities. The enrollment, which at the time of its inception was 221, is 11,500, greater than that of any two other state educational institutions in the South combined.

The main university includes schools of arts and sciences, law, medicine, pharmacy, education, and business administration, colleges of engineering and nursing, a division of extension, and a graduate school. Its extramural division includes bureaus of business research, research in social sciences, research in zoology, economic geology, engineering research, industrial chemistry, extension teaching, industrial teacher training, interscholastic league, nutrition and health education, and visual instruction. It is not difficult to understand, therefore, that the magnitude and scope of the work conducted at this institution should require an extensive physical plant.

At the time of its creation the university was endowed with a vast acreage of west Texas land. It was hoped that the revenue accruing therefrom would be sufficient not only to develop the institution's physical plant, but to defray its operating expenses as well. The Texas Constitution prohibits its receiving any appropriation from general revenue of the state for physical development purposes. The arid nature of the land, however, made it suitable solely for grazing purposes, and grazing rentals were not sufficient to fulfill the purposes for which the endowment had been made.

It is obvious, therefore, that money for building purposes must be derived from its endowment. The growth of the university was dependent upon the development of the natural resources deposited in its two million acre domain. Under normal circumstances the trend of physical plant growth would no doubt have followed closely the attendance characteristic. Unfortunately, the money accruing from its land would not permit a building program which even began to approximate the attendance

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Fig. 2 (Left). Typical shack which was used for classroom purposes in 1928. Fig. 3 (Right). The Chemistry building, first structure erected from oil royalties, replaced 10 shacks.

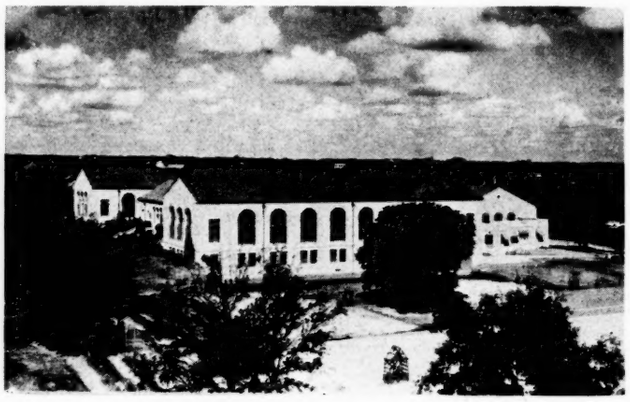


Fig. 4. Second building completed by royalty financing was the men's gymnasium. Besides the physical training facilities, the building contains a large auditorium seating 8000.

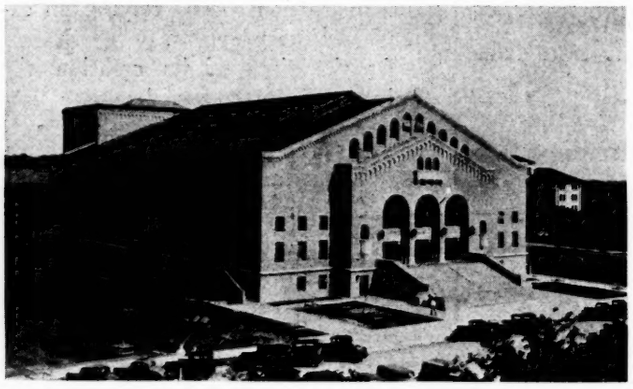


Fig. 5. Erection of this women's gymnasium made possible the further demolition of the wooden shacks. Blast heaters warm the large rooms in both gyms.

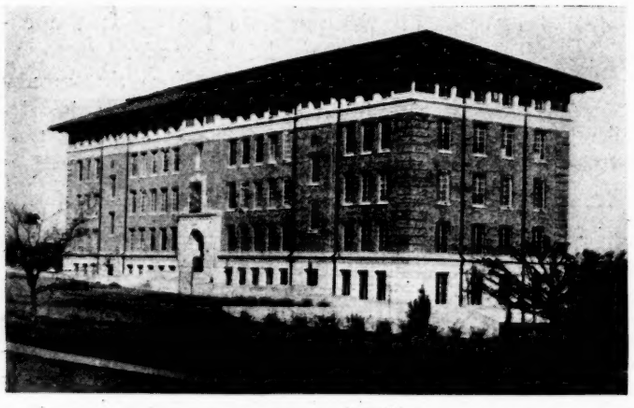


Fig. 6. Waggener Hall was the first classroom building erected by the royalty money. Direct cast-iron radiators are used.

characteristic. As a result of this circumstance a most deplorable incongruity was soon developed. The character of the work conducted by the institution caused it to be selected by students in ever increasing numbers, but the meager funds available would not permit a physical development in keeping either with the character of the courses offered or with the number of students enrolled.

Need for New Buildings

In 1928 practically the entire physical plant was located upon the institution's original 40-acre campus which had been set apart as a site for The University of Texas in the days when Texas was a republic.

The buildings consisted for the most part of temporary structures. The permanent buildings were few in number and they were widely separated in arrangement. The temporary structures were in reality practically all remnants of C.M.T.C. cantonments constructed during the World War. The nature of these buildings was such that properly heating them became an absolute impossibility. They had originally been heated by the use of stoves in which wood and coal were burned as fuels. No effort had been made to ventilate any structure.

Many thousands of dollars worth of laboratory equipment, valuable records, prized collections, rare specimens, and other possessions were of necessity housed in these insecure, highly inflammable, inadequate, unsightly, and poorly heated buildings. The institution, however, continued to grow and the need for a modern and well designed physical plant grew greater each year.

Initial Building Program

The university then passed into an era in which a single building was constructed each time its accumulated funds permitted such a program. Generally speaking, buildings were provided first for those departments which suffered greatest from the effects of the "wooden shack" era.

Then, fortunately, oil was discovered on the university's land domain. Soon the meager funds accruing from grazing rentals were being augmented by the royalties received from the production of oil.

The Chemistry building was then constructed at a cost of almost $1 million. The laboratories, classrooms, and offices of this structure were small enough to make the use of exposed direct cast-iron radiation for heating purposes. In the large chemistry lecture hall, however, it was necessary to employ an isolated indirect heating system. The ventilating systems, required to remove chemical fumes, are extensive and numerous. The heating equipment provided had to be liberally proportioned so that normal temperatures might be maintained within laboratories and demonstration rooms even though frequent air changes are required.

Gregory gymnasium was next constructed. This was designed as a gymnasium for men and as an auditorium for the institution as a whole. The main auditorium

and the swimming pool wing have large cubic contents and high ceilings. For these reasons the heating system provided for them consisted almost entirely of unit heaters. Small gymnasiums, offices, and classrooms are heated by direct exposed cast-iron radiation.

A women's gymnasium was next constructed. The cubic content of the gymnasiums, swimming pool, locker and shower rooms of this building, although not so large as those involved in the Gregory gymnasium, was still too large to make a system of direct radiator heating feasible. In the gymnasiums, however, the heating equipment could not be exposed. The capability on the part of the heating system for circulating air in the off-heating season period as well as maintaining the proper temperatures in the heating season period was regarded as being essential, so that blast heaters were used. Offices and classrooms have direct cast-iron radiators.

The next step in the program to remove the wooden shacks consisted of the construction of Waggener hall, a classroom building, subdivided into comparatively small classrooms and offices, and heated by direct cast-iron radiators.

Second Step—$5 Million Program

In 1931 the university found itself in a position to finance a $5 million building program, which involved the simultaneous construction of nine large buildings, bringing to an end the wooden shack era.

A great variety of heating and ventilating equipment was involved in the design of these nine structures which were to be used for widely differing purposes. This building group consisted of library, home economics, physics, engineering, auditorium, union, architecture, men's dormitory, and geology buildings.

Of these, the library, auditorium, and physics buildings were provided with indirect heating systems which can be used for ventilating as well as heating.

The cubic content of reading rooms in the library was exceptionally large and the ceilings in these spaces unusually high. Books, furthermore, required atmospheric conditions which made desirable six indirect heating systems, so complete that to condition the air only the refrigeration equipment needs to be added.

The physics building houses instruction, seismographic, radio activity, standards, electrical measurement, electric wave, photographic, optics, and spectroscopic laboratories which contain a great amount of sensitive and delicate equipment, classrooms, lecture halls, and an astronomical observatory. The localization of temperatures frequently experienced in the case of buildings provided with direct heating systems was undesirable, so that the building was provided with an indirect heating system.

Engineering Building

The classrooms and offices of the engineering building are comparatively small. The engineering laboratories, on the other hand, were designed in accordance

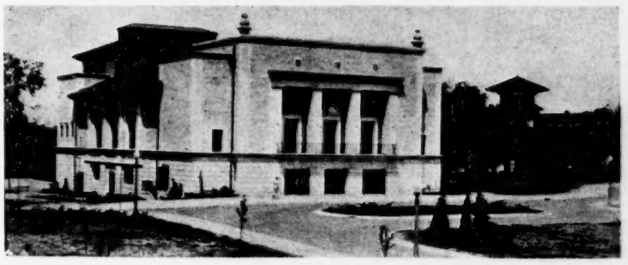


Fig. 7. Hogg Auditorium is one of the nine buildings financed under a $5 million building program. Most of these are illustrated in Figs. 7 to 13, inclusive.

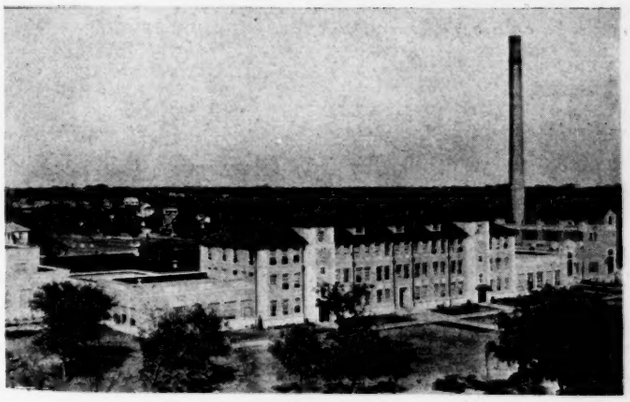


Fig. 8. The Engineering Building has a saw-toothed type roof construction in the laboratories, making use of unit heaters desirable.

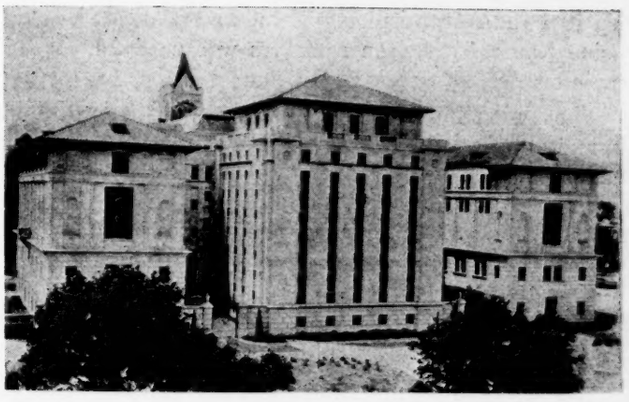


Fig. 9. A rear view of the first section of the library erected at a cost of $1 million. Only refrigeration has to be added to completely air condition this building.

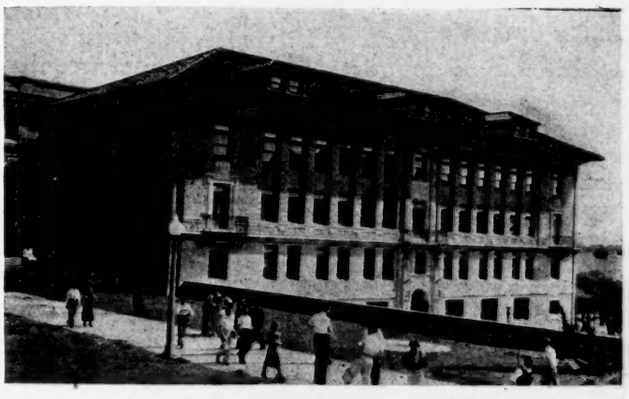
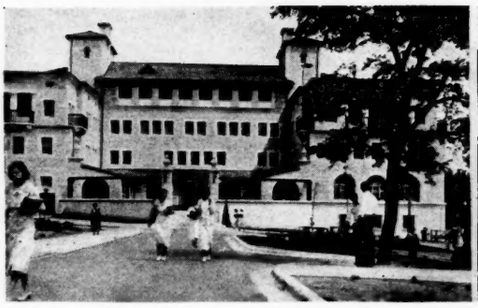


Fig. 10. Geology building contains a large lecture hall heated by an indirect system. The classrooms in the remainder of the building have direct cast-iron radiators.



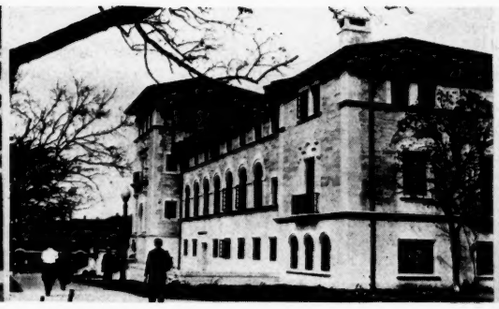


Fig. 11 (Left). Unit ventilators are used in the cafeteria and cooking laboratories of the Home Economics building. Fig. 12 (Center). Union Hall, center of the student activities, contains a cafe, cafeteria, and lounges for men and women. Fig. 13 (Right). The Physics building is provided with a specially designed indirect heating system.

with latest industrial practice. The high ceilings and saw-toothed type of roof construction made the use of unit heaters there highly desirable.

The heating system selected for the home economics building was a direct heating system employing both radiant and convector units. Copper convectors were used where concealment of the heating unit was regarded as essential. The ventilating problems in the building's cafeteria and cooking laboratories were solved by the installation of unit ventilating systems.

The geology building differs from the conventional classroom buildings only because it contains one large lecture hall. This lecture hall was provided with an isolated indirect heating system, and a direct system using exposed cast-iron radiators was used for the remainder of the building.

The Union building contains a cafe, cafeteria, main lounge, men's lounge, women's lounge, and ex-student activities. The larger rooms of this structure are heated and can be ventilated by two separate indirect heating systems. Offices, tea rooms, and small banquet halls were provided with a direct heating system.

A New $2 Million Program

The earnestness with which the institution's governing body, the board of regents, and its administrative officers desired to develop and upbuild the university can hardly be overestimated. No sooner had the $5 million building program been completed than a new program was planned. At the present time a $2 million building program has already been started. This involves the construction of an administration building at a cost of $1.6 million. This program, furthermore, involves the construction of two dormitories at a total cost of approximately $400,000. These three buildings are being constructed by the university with the assistance of the Government through its PWA.

With the completion of the program for physical development which is now in progress, the ambitions of the university will by no means have been fulfilled entirely. The university's oil producing property may yet be further exploited. Potash and other mineral deposits on this institution's domain may at some subsequent date be developed.

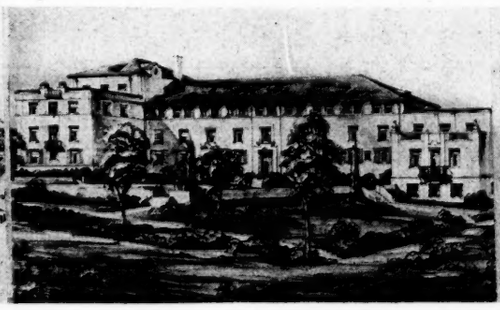
Future Building Activities

In order that this future development of the physical plant of this educational institution may be logically undertaken, plans for the future development have for a number of years henceforth already been prepared by the institution's consulting architect, Paul Phillipe Cret.

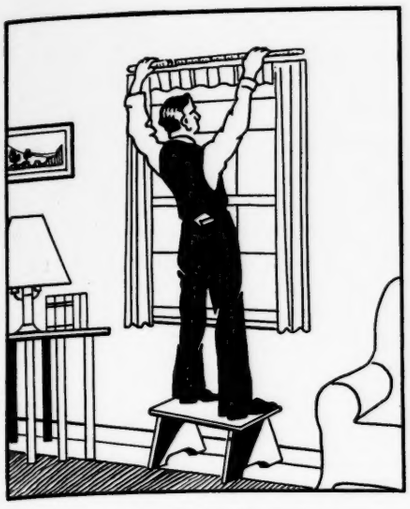
Past experiences have definitely proven the great potential of this educational institution and these experiences have, furthermore, definitely demonstrated that "what is not yet, may be."

In a subsequent installment, the nature of the heating and control systems will be described.

Three new buildings which will be constructed under a new $2 million building program. Fig. 14 (Left). Administration building. Fig. 15 (Center). Women's dormitory. Fig. 16 (Right). Men's dormitory. These three buildings are being financed with a PWA loan.



Notes on Forced Warm-Air Heating Layouts†



1. Determine heat loss

2. Calculate air volume

3. Compute duct sizes

By J. E. MAYNARD‡

BEFORE proceeding with the layout it is necessary that at least three factors be determined.

First: Determine the heat loss or heat requirements for all spaces to be heated.

Second: Calculate the amount of air to be delivered to each space.

Third: Compute the size of all pipes, risers, and registers for these spaces.

In determining the heating requirements one must consider all portions of the building space where the heat within can be lost to the outside or cooler air, such as the exterior walls, floor, ceiling, glass, and infiltration.

To calculate the amount of air to be delivered to each room or space one must determine what register air temperature will be used, i.e. the temperature of the air as it leaves the register. The cooler the air temperature the greater the volume of air required and the warmer it is the less the volume. The greater the volume of air handled per minute the more rapid will be the air change or recirculation. The less the air change while maintaining uniform heating and humidification the better.

Register and pipe sizes depend upon the velocity of air flow through the registers and pipes. The greater the velocity the smaller the areas required, and vice versa. Care should be exercised in selecting a velocity high enough to create pressure within the system for satisfactory operation. Too slow a velocity will not deliver air in sufficient volume to the more remote sections of the system. On the other hand, too high a velocity may create undue friction and possibly air noise. Friction varies as the square of the velocity, which means that the friction increases four times when the velocity is doubled. Low velocity calls for larger size pipes or ducts than if a higher velocity is used. In small or average residences the main or branch duct velocity can be as low as 400 f.p.m., but in the larger residences a safe limit of 800 f.p.m. in main ducts and 600 to 700 f.p.m. in branches is recommended. Recommended register air velocities range from 250 to 300 f.p.m. for baseboard registers and from 500 to 800 f.p.m. for high up registers.

Register Locations

After the heating requirement, the air volume, pipe and register areas have been determined, register locations should be selected. In doing so it is well to start with the plan of the highest floor and study the location of the partitions and walls of this floor with relation to those of the floor below. By so doing one soon determines the location which will work to the best advantage. The next floor below is then started, the riser locations for the upper floor being indicated on the plan before proceeding with the placement of the registers.

Size, exposures, and nature of the room play a big part in the engineer's decision as to the number and location of registers to be used. Some prefer the use of a register placed 6 ft. 6 in. or 7 ft. above the floor, others prefer the baseboard location; some locate the registers on an inside wall and others favor the outside wall or a location in close proximity to outside exposures.

Tests carried on at the research residence in Urbana, Ill., on warm-air registers located near the ceil-

†Abstracted from the author's paper "Layouts for Air Conditioning, Including Warm Air Heating," presented at the annual meeting of the National Warm Air Heating and Air Conditioning Association, December, 1934.

‡Chief heating engineer, Fox Furnace Company.

ing and near the floor revealed that with the high register and an outlet velocity of 785 f.p.m. the diffusion of the warm air was outward and close to the ceiling with a slow drift of the air back toward the register and above the 5 ft. or breathing level; there was also a tendency toward air stratification at the ceiling. With the baseboard register the tests show that the circulation of the air in the room was more general and that high velocities were not necessary to overcome the effect of stratification.

From the standpoint of heating which of the two locations is better? Heat loss is proportionate to the temperature difference from one side of a wall to the other. With 120° to 150° air coming from a high register it is reasonable to expect that the ceiling air temperature will be considerably higher than would prevail with the same temperature of air leaving a well placed baseboard register and giving up a considerable portion of its heat to the room air and building construction before reaching the ceiling level. This being the case, the baseboard register must be more efficient and therefore the better for heating.

For a cooling system there is no doubt but that better distribution of the cooled air can be obtained with the high register. For a combination cooling and heating system, the register location, whether in the baseboard, floor, or 7 ft. above the floor, should be determined from the relative importance of the heating or cooling. If the system is for southern latitudes where cooling is the primary consideration and heating secondary, then the high register may be used. On the other hand, if the system is for territory in the northern latitudes where the outdoor temperature during the summer reaches 90° but a very few days and heating is the primary consideration, the baseboard register may be the choice.

An engineer after deciding upon the location of a register as regards height or elevation should next consider the location with regard to the character of the room. Warm air registers should never be located where large pieces of furniture will obstruct proper flow of the wam air. It is advisable to keep toward the ends of large wall spaces, thus permitting the placement of davenports, pianos, and other large pieces of furniture, but the location should never be determined to the detriment of good heating of the room or space. It is the practice of the author and his associates to so locate registers that a blanket or curtain of warm air is placed over the outside wall exposures wherever possible.

Cold Air Returns

The number of return air intakes plays an important part in the elimination of drafts within a building. The fewer the returns the greater the tendency toward drafts. Return ducts should be brought back from as many rooms as possible, kitchens and bathrooms excepted, and care should be taken to withdraw from each room, or series of intercommunicating rooms, air equivalent to the amount delivered to the room or group of rooms.

Registers should be used on returns for closing the intake when the windows are opened. If grilles or faces are used, much cold air will reach the heating unit and unnecessarily increase the fuel expense.

Return air intakes should not be placed in bathrooms or kitchens. For satisfactory heating of bathrooms during the night hours, they should be vented if the room is tightly sealed. Very often the bathroom door fits so close to the floor or a saddle that when the heating unit is in operation pressure rapidly builds up within the room, thus retarding the flow of heated air. When this condition exists, unsatisfactory heating prevails. To provide satisfactory circulation under these conditions, a vent should be placed in the room and terminate in the attic space with a balanced louver. If this is not practical clearance beneath the door should be provided or the door left ajar.

Laying Out Ducts

After all warm-air and return-air registers and risers have been indicated on the basement plan, work may be started in laying out the duct system. The system may be one of two types: the individual pipe system or the trunk line system. The individual pipe system is one in which separate pipes lead from the heating chamber to each register and from each return-air register or grille to the blower compartment. A trunk line system may comprise one or more main ducts leading from the heating chamber, each main duct having two or more branch pipes leading therefrom. The return air system may be likewise designed with the ducts terminating at the blower compartment.

The individual pipe system is generally used in the smaller residences and requires less care in designing. It is also used considerably in replacement work, when a gravity furnace is replaced with a mechanical system.

The trunk line system is applicable to both the small and large residences. It permits placing the heating element or air conditioner in one corner of the basement and running the ducts close to the ceiling, thus providing more basement space for other purposes. For the average residence, the trunk line system can be designed by the method given in the Code for Mechanical Warn Air Furnace Heating Systems in Residences. This method has proven highly satisfactory and of much help to beginners. For large residences much care should be taken in the design of all portions of the duct system, and it might be advisable to design the system on the pressure loss method or the velocity method.

The areas of the pipes for various portions of the building, irrespective of the method used in determining same, are for round pipes, and if rectangular ducts are to be used, they must be proportioned for equal friction of the round pipe size. The duct dimensions can be determined from a chart given in the Code pamphlet.

Wherever it is necessary to make a change in the elevation of a duct, the change should be made on an angle of 30° from the horizontal. Long sweeping el-

(Concluded on page 72)

GETTING DOWN TO FUNDAMENTALS

1—Heat Quantities, Their Nature and Direction of Flow

BEFORE anything can actually be done on a reasonable basis about providing a heating or cooling plant for a building it is necessary to know enough about the amounts of heat which must be supplied or absorbed, in order to make a reliable estimate.

The estimate cannot be reliable unless it is based on good figures which are built up in a logical way, and then well applied in making the estimate. Even with good information, the process of actually getting the estimate together cannot be suitably performed until the user has two fundamentals. One of these is a knowledge of the nature and general laws of heat itself, what it is, and how it acts. The other is the more specific knowledge of how these laws and acts work out when applied to the particular building he is considering. Let us look into this and see what a consideration of the fundamentals shows.

Easiest and simplest is to take an elementary case. Fig. 1 shows a cross-section of a simple building—a dwelling let us say—on a severe winter day when the outside temperature is 0° and the heating plant is succeeding in keeping the air temperature inside at 70°.

Evidently here we have an enclosed air space at a temperature higher than the temperature of the surrounding air. In other words, a temperature difference exists. By the basic law of heat flow, heat *always* flows from the high temperature toward the low. It does this by any means possible and moves along any path possible.

The Three Heat Quantities

Among the possible paths are (1) the outside walls, (2) the ceiling and roof, (3) the floor and surrounding ground, (4) the windows, and (5) anv interior walls cooler on the outside than on the inside. In all these instances the path of the flow is right through the building materials themselves and the heat is said to be "transmitted" through these constructions. This gives rise to the practice of grouping all these quantities of heat together and calling them "transmission flows," or more generally, transmitted heat."

The heat which leaves the building enclosure by all the paths just listed is not carried by air. It passes in the form of real heat energy, i.e., a form of motion of the particles of the building materials. In addition to this there is heat which passes by any air circulation between the inside of the building and the outside.

Air circulation takes place in either or both of two ways. In the first place the building is not airtight. There are cracks and openings, and air passes through them. To a considerable extent its flow is unwanted and involuntary. Because the cracks and openings are usually small, the air "filters" through them and we call this air "filtering air" or "infiltering air" and the heat passing with this air we can call "filtration heat." Common wording is to call it "infiltration" although this is entirely without meaning as a descriptive word. The other way that air finds its way into and out of the building is by deliberately bringing it in and expelling it again. The heat passing because of this practice is called "ventilation heat."

Thus, fundamentally, we have three separate and distinct heat quantities to be considered, viz:

(a) Transmitted heat
(b) Heat from filtration air
(c) Heat from ventilation air

These heat quantities are, in nearly all cases, the only ones which enter into the making of an estimate for constructing either a heating or a cooling plant for a building. No matter how confusing or how complicated a particular problem may seem it can usually be fully clarified by keeping these fundamental heat quantities in mind.

The reason we say *nearly all cases* is because in some instances there is a fourth heat quantity. This arises where heated or cooled goods or people pass into or out of a heated or cooled building or where heat is produced or absorbed by some process going on. These changes or processes involve heat. Only in specialized problems do they affect the estimate, however, for the heat quantities are usually small and unimportant. Instances where they are important are: theaters, and like places, where crowds enter or leave suddenly; storage warehouses, or similar places, where quantities of goods are quickly moved in or out. This heat quantity occurs so seldom in practice that it has no one generally accepted name.

Before leaving the subject we should understand the nature of these several quantities and how often they are met with in practice. The "transmitted heat" and the "heat from filtration air" are always present. They are not preventable by any known means although either may be greatly reduced if desired. The third quantity, viz: "heat from ventilation air" is absent in many estimates. Keep in mind that it is deliberately used or not entirely at the will of the designer. In many cases the air drift, or circulation, due to filtration is enough (or even too much) to take care of all ventilation requirements and no ventilation air in addition is needed, wanted, or provided for. In that case the quantity disappears from the estimate entirely. As noted, the fourth quantity is present but rarely in ordinary building practice.

Directional Relations of the Heat Quantities

With an understanding acquired of where the several heat quantities arise, the next fundamental is to

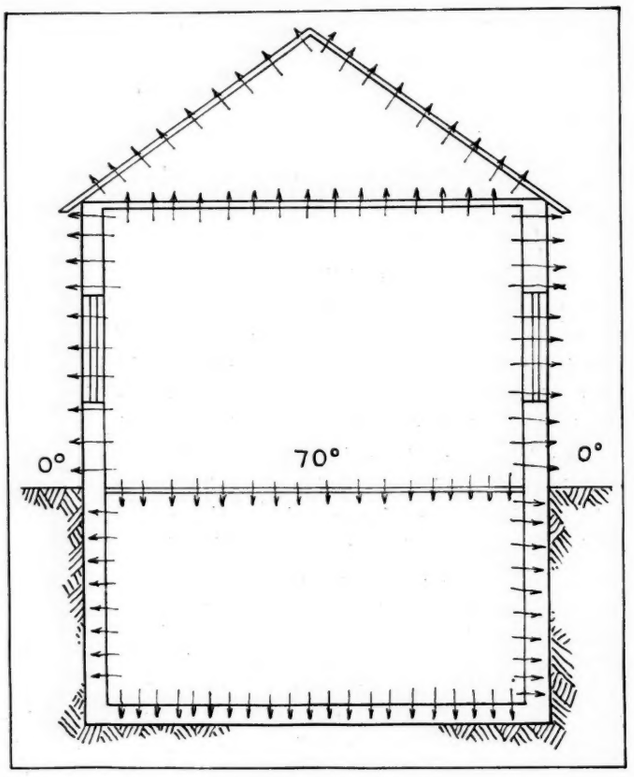


Fig. 1. Transmitted heat flows out of buildings by all possible paths

know fully the directional features of the heat flow which give rise to these quantities for they affect both the design estimate and the operation of the plant after it is built.

Fig. 1 shows in diagram a simple structure on a severe winter day. In this case the Transmitted Heat is shown flowing outward from the interior toward the outside. The effect of this is to carry heat *away* from the building. The flow continues in this direction as long as the temperature of the outside *surface* of the walls, windows, roof, and ceiling, and the ground in contact with the floor is lower than the temperature of the inside surfaces. It is important to note carefully and to understand fully that it is not the outside or inside *air* temperatures which fundamentally govern the direction of their flow at any time. In many cases, especially at the time of the winter peak, the air temperature *may* govern the direction of flow. As the amount of the winter peak has usually been the quantity most sought after, in practice it is often tacitly assumed that the direction of flow of the transmitted heat is governed by outside air temperature. Anyone who wants to really get down to fundamentals must keep in mind that it is not. Actual field measurements have shown the direction of flow in reality may shift often and quickly. Especially is this true in summer when sun heat becomes important in determining the temperature of the outside surfaces of a building. It is never easy in practice, and often actually impossible, to determine the direction of flow of the transmitted heat at any particular time. In general, the flow is outward throughout the winter months and throughout all the hours of a severe winter day. On mild winter days during the daylight hours the direction of flow is questionable. On hot summer days the direction of flow is generally reversed and heat flows toward the interior throughout all hours, although the sun effect is especially marked only during the daylight hours. On spring and fall days the direction of flow is extremely likely to change often and to change at least twice a day, namely, between day and night. In early spring and late fall the direction tends toward the winter characteristics while in early fall and late spring the tendency is to resemble summer conditions.

The whole matter of the direction of flow of transmitted heat through building materials is in a confused state with little known in such form that the information can be applied.

Filtration heat, being carried by air which passes through small holes or cracks, travels in whatever direction this air travels. Air always travels from a region of high pressure toward a region of low pressure. Thus, it is evident that the direction of this heat flow depends on factors totally different than those governing the direction of flow of transmitted heat. Temperature difference rarely has anything to do with the direction, pressure difference is the important factor. Occasionally, temperature does have its effect as in the case of a high building where temperatures cause a difference in pressure to be set up.

Consider first the simplest case where filtration heat flows—a low building like that in Fig. 2. When there is no wind and the air outside the building is quiet there will be little tendency for the outside air to get inside the building or for the air already inside the building to pass out. The reason is that the air pressure on the inside is practically the same as that on the outside.

Now let us suppose that the wind starts blowing in the direction shown. The air which strikes the windward side is suddenly stopped by the unyielding face of the building. At the edges, corners, and near the ground it no doubt swirls and eddies. Where there are cracks and openings in the building construction or in the materials, the air is not stopped but finds its way through the openings, being propelled in by its own speed. The result of this is that there is now more air inside the building than there was before. Since this greater quantity of air can occupy only the fixed volume of the building, the pressure of the air inside should increase slightly, especially in the region just inside where the cracks and openings are.

At the same time that the air stream is striking the windward side of the building, being stopped, and building up a pressure, other parts of the stream sweep along roof and side walls with little diminished speed. They swoop and swirl around the edges at the leeward side. Experiments, observation, and theory all go to create the generally accepted belief that the pressure just outside the building walls on the leeward sides decreases due to this action. This sets up a condition close to the building on the leeward side which causes air to pass out of the building into the outside air. This air finds its way out of cracks and openings on the leeward side just as the outside air finds its way in on

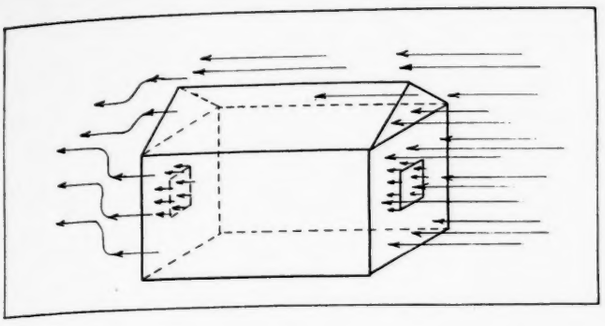


Fig. 2. How wind strikes low buildings

the windward side. The air leaving the building tends to counteract the urge to build up a pressure inside the building. The result is that over the whole volume of the building it is doubtful if the pressure actually changes more than very slightly.

To one who follows fundamentals there is but little really authentic information in existence of direct use in trying to explain or understand exactly what happens in this complex situation set up when a wind blows against a low building like Fig. 2. The one fact which stands out is that when the wind blows there actually is a gradual "drift" of air from the windward side toward the leeward. There is also a strong supposition that the amount of air finding its way in is exactly equal to the amount finding its way out. Air really *circulates* right through the building under the influence of the pressure differences created by the wind energy.

Another case of interest, and of fundamental importance, is shown diagrammatically in Fig. 3, where the building is high and relatively narrow—an eight-story building being represented. Here the wind strikes the building just as in Fig. 2 and the same general conditions are set up. Again there is a drift of air across the building from windward to leeward. The additional feature is that instead of the air drift being so strongly horizontal there is a force which tends to cause the drift to veer off vertically. This is because of the tendency of air to stratify at various temperatures, to so-called "stack effect." The net result is that the course of the air drift is altered and air tends to flow vertically in the building as well as across. Two forces are acting to set up pressure differentials along which the air can flow. Here, again, little is known in detail about the nature of the currents set up. In high buildings the effect of this vertical flow is important, for in such cases the drift is greater in amount than in low buildings.

Unlike the directional relationships of flow of transmitted heat, the flow of infiltered air does not reverse itself daily or seasonally. Its *direction* of flow is governed almost wholly by the wind direction at any time, although temperature conditions at various heights influence it greatly at times.

Now comes the question of how this flow of infiltering air is related to the heat quantity which we have called filtration heat. It is important to get a clear understanding of the fact that the filtration air is not the same as the filtration heat. The circulating air merely carries heat along with it. To get this straight, suppose that the air which enters the building in Fig. 2 through cracks or openings on the windward side simply floats through and leaves on the leeward side at the same temperature at which it entered. In this case the heat which the incoming air brings with it is the same in amount as the leaving air takes with it. There has been no net heat interchange between the inside and outside of the building, although there has been infiltering air flowing through the building. Thus, there can be infiltering air and still be no filtration heat. This is a condition prevailing on the windy days in spring and fall when the outside air temperature is the same as the temperature maintained inside the building. In the winter when the outside temperature is lower than that maintained inside, the incoming cold air mixes with the warmer air inside the building, comes in contact with the warmer walls, passes over radiators, or rubs along warm furniture or warm inside walls. As a result, by the time it leaves the building on the leeward side it is at a considerably higher temperature than when it entered. Being at a higher temperature the outflowing air carries away more heat than the incoming low temperature air brought in with it. The result is that there is a net loss of heat from the building interior. In summer when the outside temperature is higher than the temperature maintained inside, the heat action is reversed although direction of air drift may remain the same. The warmer incoming air mixes with cooler inside air, passes over cooling surface, over cool walls and furniture. By the time the air is ready to leave the building on the leeward side its temperature is lower than when it entered. It has left heat inside the building in its passage through. The net result is a gain in heat inside the building.

Thus, during the course of the year the net effect of the heat quantity changes even though the actual direction of the air drift itself remains steady.

Fundamentally, the flow of ventilation air is similar in many respects to the flow of filtration air. When ventilating air passes through a building by so-called "natural" ventilation it can be considered as merely increasing voluntarily the amount of filtration air flow-

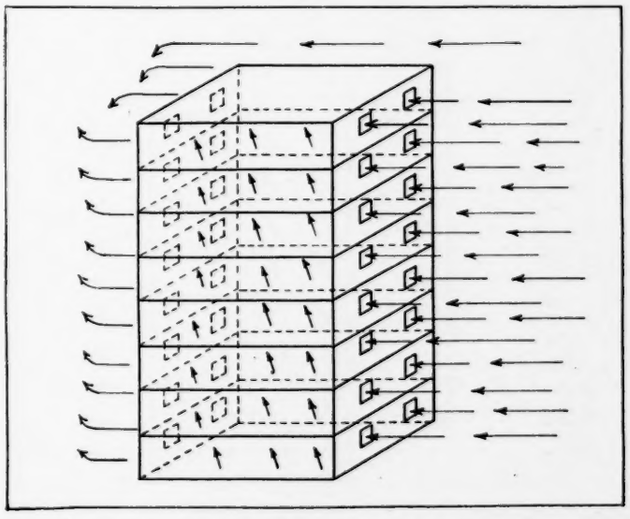


Fig. 3. Wind effects on high buildings

ing. In natural ventilation the pressure differences causing flow are due to energy contained in the air itself. In the most common case it is wind energy. The amount of air flowing can be controlled to some extent and the direction governed by the use of suitable devices, but these devices do not make use of applied energy except what is already contained right in the air. On the other hand, "mechanical" ventilation is by definition obtained by using power-driven devices to set up the pressure differential along which the ventilation air flows. It is well to keep this fundamental difference between natural ventilation and mechanical ventilation in mind.

Exactly the same relation exists between ventilation air and ventilation heat as between filtration air and filtration heat. Thus, we can have ventilation air flowing and still have no ventilation heat. This case occurs when the outside air is at the same temperature that is being maintained inside. In winter when the ventilation air enters at a temperature lower than it leaves the building, the heat effect of the flow of ventilation air is to take heat away from the building. In summer when the air enters at a temperature higher than it leaves, the heat effect is to add heat to the building. In all cases the actual direction of flow of the ventilation air is from the outside, through the space to be ventilated, and out again. In a system of mechanical ventilation this path is fixed and a definite channel is provided for the flow as well as means of furnishing motive energy.

Having noted the fundamental heat quantities which are involved in preparing to make an estimate from which actual details of a working installation can be derived, with an understanding of what causes these quantities of heat to be present, and having noted their directional relations at various seasons of the year, we are in a position to set up fundamental expressions showing how these quantities enter into the estimate. In other words, we are ready to consider the fundamentals as actually applied to the general problem.

There are two relationships which are of importance for estimating purposes. One is the situation existing in winter at a time when the severest demand for heating can be expected, and the other is for summer when the greatest difficulty in cooling can be looked for. Evidently if our estimate can determine the heat quantities at these two times, and if the plant is erected to take care of them, it should be able to take care of all other demands made on it, if provision is made for operating it with due regard to intermediate conditions.

Air Blows Dirt from Heating System Risers

As is customary in all modern heating systems, dirt pockets are provided in the risers serving the radiators of the Empire State Building, New York.

These are short lengths of pipe connected into the tees at the bottom of the risers and closed off at the ends by either 1-in. plug cocks or pipe caps. In the course of time these pockets gradually fill up with dirt and must be cleaned; otherwise steam flow will become sluggish. In fact, in this building some of the risers have been completely stopped up with scale and dirt from the steam main.

There are some 238 return and supply risers varying in size from 1½ to 4 in. in diameter. It can be appreciated that cleaning the dirt pockets in the heels of all these risers is a considerable undertaking, particularly as many of them are in hung ceiling spaces, where it would be dangerous to the men doing the work and likely to damage the ceiling if these pockets were cleaned while steam was on the heating system. With steam on, it would, of course, be impossible to clean those dirt pockets that have only pipe caps. With no pressure on the heating system, it is difficult to get all the dirt out. Often both considerable time and labor are required to work it out through the valve with a wire or other implement.

To make this work easier and to lessen the time required, C. F. Wendland, chief engineer of the Empire State Building, conceived the idea of using compressed air to blow the dirt out through the pockets. This it seemed would possess many advantages. There is no danger to workmen from steam. There is no likelihood of injury to the ceiling from condensed steam or water coming through the open valve, as would be the case when the system is in service. In addition, there are certain places where a horizontal run of pipe precedes the dirt pocket, and the dirt collected there is more likely to be moved and blown out with air than with steam, because it is dry when the air is used.

Rotary air compressors, normally used to operate sewage ejectors, were available to supply compressed air. Three of these were used, two having capacities of 94 c.f.m. each, driven by 10-hp. motors, and the other a 230-c.f.m. compressor driven by a 25-hp. motor, giving a combined capacity of 418 c.f.m.

A trial disclosed that 7 lb. per sq. in. pressure could be built up on the system in 12 min. The trial also indicated that pressures of 7 to 8 lb. were in many cases too much and that the dirt could usually be blown out with pressures as low as 3 to 4 lb. All of the return and supply risers that have dirt pockets in the basement have now been blown. The 111 dirt pockets were cleaned in approximately two days of work. Some of these pockets were found clogged tightly and a wire had to be poked up to loosen the dirt. Most of them were found to blow through without any such urging. Most of these lines had never before been cleaned.

All of this work has been done with the regular building staff during the summer months in spare moments. The number of pockets cleaned so far indicates the method to be highly practical, and remaining pockets will be cleaned as time permits.—*Power*

DIMENSIONS AND WEIGHTS OF STANDARD COPPER AND BRASS TUBES (IRON PIPE SIZE)

Pipe Size	Dimensions in Inches			Pounds per Foot		
	O. D.	I. D.	Wall	Brass	Red-Brass	Copper
⅛	.405	.281	.0620	.246	.253	.259
¼	.540	.375	.0825	.437	.450	.460
⅜	.675	.494	.0905	.612	.630	.644
½	.840	.625	.1075	.911	.938	.959
¾	1.050	.822	.1140	1.23	1.27	1.30
1	1.315	1.062	.1265	1.74	1.79	1.83
1¼	1.660	1.368	.1460	2.56	2.63	2.69
1½	1.900	1.600	.1500	3.04	3.13	3.20
2	2.375	2.062	.1565	4.02	4.14	4.23
2½	2.875	2.500	.1875	5.83	6.00	6.14
3	3.500	3.062	.2190	8.32	8.56	8.75
3½	4.000	3.500	.2500	10.85	11.17	11.42
4	4.500	4.000	.2500	12.30	12.65	12.94
4½	5.000	4.500	.2500	13.74	14.14	14.46
5	5.563	5.062	.2505	15.40	15.85	16.20
6	6.625	6.125	.2500	18.45	18.98	19.41
7	7.625	7.062	.2815	23.93	24.62	25.17
8	8.625	8.000	.3125	30.07	30.94	31.63
9	9.625	8.937	.3440	36.95	38.02	38.88
10	10.750	10.019	.3655	43.95	45.22	46.24
11	11.750	11.000	.3750	49.37	50.80	51.94
12	12.750	12.000	.3750	53.71	55.27	56.51

Above is a table of the dimensions and weights of standard iron pipe size brass and copper pipes. Iron pipe size copper and brass pipe are widely used in plumbing and heating work, in place of the thinner tubes, to provide a sufficient thickness of metal at the root of the threads to insure a reasonable degree of strength where the pipe enters the fittings. The threads used on I.P.S. brass pipes and in their fittings are the regular "Briggs" or iron pipe standard thread. The weights shown will vary slightly in actual practice.

EXPANSION OF PIPE—IN. PER 100 FT.

Temperature, °F.	Material			Temperature, °F.	Material		
	Steel	Wrought Iron	Copper		Steel	Wrought Iron	Copper
0	0	0	0	300	2.374	2.488	3.451
20	0.148	0.154	0.238	320	2.545	2.648	3.696
40	0.285	0.313	0.451	340	2.717	2.836	3.941
60	0.448	0.448	0.684	360	2.884	3.023	4.176
80	0.580	0.628	0.896	380	3.066	3.198	4.424
100	0.753	0.787	1.134	400	3.230	3.369	4.666
120	0.910	0.958	1.366	420	3.421	3.568	4.914
140	1.064	1.113	1.590	440	3.595	3.748	5.154
160	1.223	1.275	1.804	460	3.784	3.944	5.408
180	1.383	1.445	2.051	480	3.955	4.128	5.651
200	1.546	1.626	2.296	500	4.151	4.325	5.906
220	1.707	1.784	2.516	520	4.342	4.525	6.148
240	1.875	1.958	2.756	540	4.525	4.714	6.410
260	2.038	2.127	2.985	560	4.715	4.905	6.646
280	2.205	2.313	3.218	580	4.906	5.116	6.919

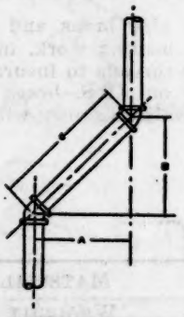
The above table of the elongation of pipe due to increases in temperature was calculated from the Holborn and Days formula using 0° F. as the base. To determine the increased length due to expansion it is only necessary to subtract the elongation corresponding to the original temperature from that of the highest temperature. For example, a 860-ft. wrought-iron pipe line is used to carry hot water at a temperature of 200°. It was installed when the temperature was 60°. How much longer will it be when it is carrying hot water? From the table 1.626 — 0.448 = 1.178 in. per 100 ft. For 860 ft. the expansion is 10.1 in.

RELATIVE CARRYING CAPACITY OF PIPES

Diameter of Pipe, In.	Number of Smaller Pipes Equivalent To One Larger Pipe											
	Steam, Air and Gas						Water					
	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.	¾ in.	1 in.	1½ in.	2 in.	3 in.	4 in.
½	2.27	4.88	15.8	31.7	96.9	205.	2.0	3.7	11.0	20.	54.	107.
¾	1.00	2.05	6.97	14.0	42.5	90.4	1.0	1.8	5.3	10.	27.	53.
1		1.00	3.45	6.82	20.9	44.1		1.0	2.9	5.5	15.	29.
1½			1.00	2.00	6.13	13.0			1.0	1.9	5.0	9.9
2				1.00	3.06	6.47				1.0	2.7	5.3
2½					1.83	3.87					1.7	3.4
3					1.00	2.12					1.0	2.0

The number of pipes of one size which will have the same capacity as one pipe of a larger size of the same length is shown in the above table. The table is based on the inside dimensions of standard weight wrought-iron pipe. The left hand section of the table is for steam, air, and gas while the right hand section is for water. Turbulent flow and equal velocities are assumed in both cases. Example: three 2-in. pipes are used to carry steam between two buildings. What size pipe, with the same capacity, can be installed in place of the three small pipes? On the left hand side of the above table it can be seen that one 3-in. pipe will be equal to 3.06, 2-in. pipes.

PIPE OFFSET CALCULATIONS



	22½° Ells	30° Ells	45° Ells	60° Ells
A = B ×	0.414	0.577	1.000	1.732
A = C ×	0.383	0.500	0.707	0.866
B = A ×	2.414	1.732	1.000	0.577
B = C ×	0.924	0.866	0.707	0.500
C = A ×	2.613	2.000	1.414	1.155
C = B ×	1.082	1.155	1.414	2.000

Example: Find length of pipe C when distance between risers (A) is 3 ft., assuming the elbows are 45°

C = A × 1.414 = 3 × 1.414 = 4.24 ft.

SURFACE AREA OF PIPES—SQ. FT.

Length of Pipe, Ft.	Size of Pipe—Inches											
	½	¾	1	1¼	1½	2	2½	3	4	5	6	7	8
1	0.219	0.275	0.345	0.435	0.496	0.622	0.753	0.916	1.175	1.455	1.739	1.996	2.257
2	0.44	0.55	0.69	0.87	0.99	1.25	1.51	1.83	2.35	2.91	3.48	3.99	4.54
3	0.66	0.83	1.04	1.31	1.49	1.87	2.26	2.75	3.53	4.36	5.22	5.99	6.76
4	0.88	1.10	1.38	1.74	1.99	2.49	3.01	3.66	4.71	5.82	6.95	7.99	9.02
5	1.09	1.38	1.73	2.18	2.48	3.11	3.76	4.58	5.88	7.27	8.69	9.99	11.26
6	1.31	1.65	2.07	2.61	2.98	3.74	4.52	5.49	7.06	8.73	10.42	11.98	13.51
7	1.53	1.93	2.42	3.04	3.47	4.36	5.27	6.41	8.24	10.18	12.18	13.96	15.77
8	1.75	2.20	2.76	3.48	3.97	4.97	6.02	7.33	9.41	11.62	13.90	15.95	18.01
9	1.97	2.48	3.11	3.91	4.47	5.60	6.77	8.24	10.58	13.09	15.65	17.95	20.26
10	2.19	2.75	3.45	4.35	4.96	6.22	7.53	9.15	11.75	14.55	17.39	19.96	22.57

The surface areas shown in the above table are for standard weight wrought-iron pipe. They are useful for determining the heating capacity or heat loss of pipes.

A Method of Burning Anthracite Screenings in Residential Boilers

By ROBINSON V. FROST†

IF anthracite is to come into its own, it must be provided with an appliance which will produce heat practically automatically with any size of coal. This should be done in some apparatus of simple construction so as to minimize the chance of breakdown.

If the method described in this article is followed, any size of anthracite may be burned with only a small amount of attention. A mixture of rice and silt will burn equally as well as stove or chestnut. To secure the results achieved, however, the average consumer will be obliged to unlearn much that he now considers good practice.

In selecting the apparatus, a few simple rules must be followed:

The boiler must be adequately rated.

The grate area should be preferably twice as long as wide. Round boilers can be used, but when so used the grate area must be excessively large.

The ratio of grate area to installed steam radiation is 1 to 100. Hot water in corresponding proportion.

There must be both ample flue surface and area.

Boilers should be provided with facilities for attaching under grate blowers. Blowers require pressure capacity for not less than 1.75 in. under the grate when full depth of fuel is on grates. Volume capacity in proportion to the maximum load. Fan rotors should be of sufficient diameter to provide the required pressure with 1150 r.p.m. motor.

Grates to be of size to support buckwheat.

Combustion chamber not less than 27 in. clear height.

The tools required include a slice bar, ¾-in. diameter and 3 ft. longer than the fire chamber, a hoe, a two pronged hook, a 10-tined stone fork, a scoop shovel, and a flat shovel for the ash pit.

A boiler so proportioned and equipped will be suitable to burn coke, anthracite stove, chestnut, pea, buckwheat, rice or silt, bituminous lump or slack, or oil.

The operating method for burning anthracite screenings and other small sizes of coal is extremely simple. In fact, there is danger of losing sight of the simplicity of the method and thereby failing to get best results.

To start the fire, two or three inches of ash is spread over the grate surface. Then, in the back of the firebox, pile up fresh coal until the forward toe of the pile touches the front of the firebox. In the depression in the front, pile one or two waste baskets of paper and ignite. When the paper is well burning, cover all the paper with fresh coal to a depth of three or four inches, close the fire door, and start the blower, first making sure that all the dampers in the smoke outlet of the boiler are wide open. In about ten or fifteen minutes the fuel will be well ignited and additional coal may be fired. When firing the second charge, let the blower remain in operation and continue to add coal as long as flames appear above the bed of fuel, or until the firebox can hold no more.

A rule *always* to be observed when firing fresh coal —never smother the flames with fresh coal. If the flames should accidentally be smothered, do not close the fire door, but ignite a good sized wad of paper, place it on the top of the fuel bed and wait until the gas from the coal has ignited. The fire door may then be closed with safety.

The fuel burns entirely to clinker and it is optional whether the clinker be removed daily or once in two or three days. In the coldest weather, however, removal must be daily. If removed daily, there need be but one firing period when the fire is cleaned and the fuel replenished. When ash is removed once in two or three days, fuel is replenished once in 24 hr., or, perhaps in mild weather, only as often as clinker is removed.

When clinkers are removed it is easiest, but not essential, to allow fuel bed to burn down at least to the point where all the fuel is incandescent. To remove the clinker, use the two pronged hook included among the tools. Work points of the hook down back of the hard clinker at rear of firebox and then pull the clinker loose from grates and to the top of the fuel bed. The clinker may come up in a slab, half the area of grate, or may break off in lumps. When they have been pulled to the top of the bed lift them from firebox by means of fork. Next, push with the hoe the entire mass of incandescent fuel to rear of the firebox, cleaning front of the box down to the hard clinker. Pry this clinker loose from grates by means of the slice bar, which can conveniently be bent in a slight bow in order to reach the extreme front of firebox. After the clinker has been removed from the front, then the fuel bed is ready for replenishment. Pile all the fuel in front, heaping it well above bottom of the fire door, but taking care that the incandescent fuel in rear is not entirely covered.

One is not concerned, when operating by this method, about the burning characteristics of the fuel, so long as it contains heat units. Non-clinkering is not an asset, for the coal must be burned to a clinker. If it does not, then it is advisable to burn waste material which will increase this clinkering action. It is, in fact, very convenient to dispose of household waste mate-

†President, The Frost Research Laboratory, Inc., Norristown, Pa.

(Concluded on page 72)

MODERNIZING SECTION

FHA Bill to Insure Loans for Commercial Modernizing Approved by House

and is now in the Senate; HOLC gets additional $1.75 billion; 25 states pass legislation to cooperate with Mutual Mortgage plan

THE proposal of FHA to insure character loans for the modernizing of commercial buildings such as apartment houses, factories, and stores, where the total loan does not exceed $50,000, was approved by the House of Representatives on March 12. The proposal was modified in an amendment to the National Housing Act, the amendment going through as a rider on the Administration's Home Mortgage Relief bill to enlarge the scope of the Home Owners Loan Corporation. The House passed the bill and the Federal Housing Administration amendments by a vote of 400 to 2.

The bill, which is now in committee in the Senate, authorizes HOLC to issue additional bonds to a total of $1.75 billion to take care of pending loan applications.

In connection with the Housing Administration the limit of renovation loans on homes was left at $2000. If the bill passes the Senate, FHA will launch a campaign to interest the public in "Modernizing Main Street."

In addition, another rider carried an amendment to the Housing Act extending the time limit to which modernizing loans can be made from December 31, 1935 to April 1, 1936. Orphanages, colleges, and schools were included as eligible for the commercial loans under another amendment.

During the discussion of the measure in the House the amendment was changed to increase the limit from $25,000, as originally recommended by the committee, to $50,000, as asked by the Housing Administration. In a discussion on this, the debate became so complicated that the House was forced to adjourn until the following day when the entire measure was passed.

Progress of Modernizing Campaign

For the week ending March 9, 104,315 loans had been insured by FHA for modernizing of homes, bringing the total up to $44,042,316. The Administration estimated, however, that the total amount spent on modernizing as a result of the Better Housing campaign amounted to nearly $300 million. The total number of financial institutions entitled to extend credit under the FHA requirements is now 12,691. On March 9 there were 6,375 community campaigns organized or in the process of organization.

Progress of Title II

By March 15, representative banks in all of the states had been approved as mortgagees under the Mutual Mortgage Plan of the National Housing Act. The total number of institutions receiving approval to operate under the provisions of the National Housing Act which provide for the financing of new residence construction and the refinancing of existing mortgages was stated to be 2,880. Of this total 2,304 were banks; 538 building and loan associations and societies; 26 life insurance companies (old-line), and 12 other miscellaneous institutions.

In 25 states, amendments to banking laws had been passed permitting institutions to make mortgage loans up to 80% of the appraised valuation of a property, thus affording the institutions opportunity to cooperate fully with the Mutual Mortgage Plan.

Only three states will not have such legislation acted upon this year, Virginia, Kentucky, and Mississippi, the legislatures of which meet biennially and will not convene until next year. All others have either now in committee, in the process of being drafted, or will have presented when their legislatures meet, some form of amendment that will liberalize the present mortgage laws for banks and other leading institutions within their borders, so that full cooperation may be enjoyed by all institutions qualifying for mortgage agencies under the rulings, and qualifying for insurance by the Federal Housing Administration.

(Concluded on page 73)

MODERNIZING SECTION

CONTENTS

FHA Bill to Insure Loans for Commercial Modernizing Approved by House	28
Modernizing a Brewery Service Plant	29
On the Firing Line	31
Contractor Sells All Kinds of Modernizing to Old Customers	31
Consulting Engineer Concentrates on Air Conditioning	31
Contractor Specializes in Magazine Feed and Gas Boilers for Modernizing	32
Find the Facts and You Find Mcdernizing...	33
Copper Patch Welding of Cracked Boiler Sections	36

Modernizing a Brewery Service Plant

By R. W. NOLAND†

THE Centlivre Brewing Corporation, in Fort Wayne, founded in 1862, has been operated continuously since then by the descendants of its original founder. During prohibition it was operated as an ice and cold storage plant and in 1933 work of rehabilitating the brewery was begun. The rehabilitation of the brewery proper was in charge of J. E. Siebel Sons' Company, brewery engineers, and the necessary engineering work for modernizing the service plant was entrusted to the writer. Early in 1934 the plant commenced actual operation as a brewery and has continued under full capacity.

Modernization included the reconstruction of the boiler plant building, new boiler plant, new coal and ash storage, a rehabilitated steam distribution system, and new heating systems.

Reconstruction of the Boiler Plant Building

Careful inspection of the old boiler plant building showed it to be in poor condition but the possibilities of rehabilitation were good. Due to the fact that the concrete chimney could be made serviceable and that the building was properly located, a careful study of conditions was made. It was found that the floor space requirements were sufficient for the new installation and that by careful remodeling the building could be modernized satisfactorily at a modest expenditure. Since the location is near the river no excavating work for new foundations was attempted, but a heavy reinforced concrete slab was laid over the entire floor with reinforced beams beneath the boiler units made integral with the slab. A new 12-in. brick wall was built beneath the existing north wall. The old wood roof was removed and a new steel deck type of roof with monitor was constructed. This roof was approximately 10 ft. above the old roof line. One half of the new roof load was carried on a steel I-beam supported on H-columns. This beam spans the building at the center. New windows of the factory steel sash type were installed in both the east and west walls and the walls were carried up to meet the new roof line. New doors were installed where necessary.

†Consulting Engineer, Fort Wayne, Ind.

Boiler Room Equipment

The old boiler room equipment consisted of three 100-hp. hand-fired return tubular boilers set very low in one setting. These boilers had served the old brewery for many years and were beyond rehabilitation. The new boiler room equipment includes the following:

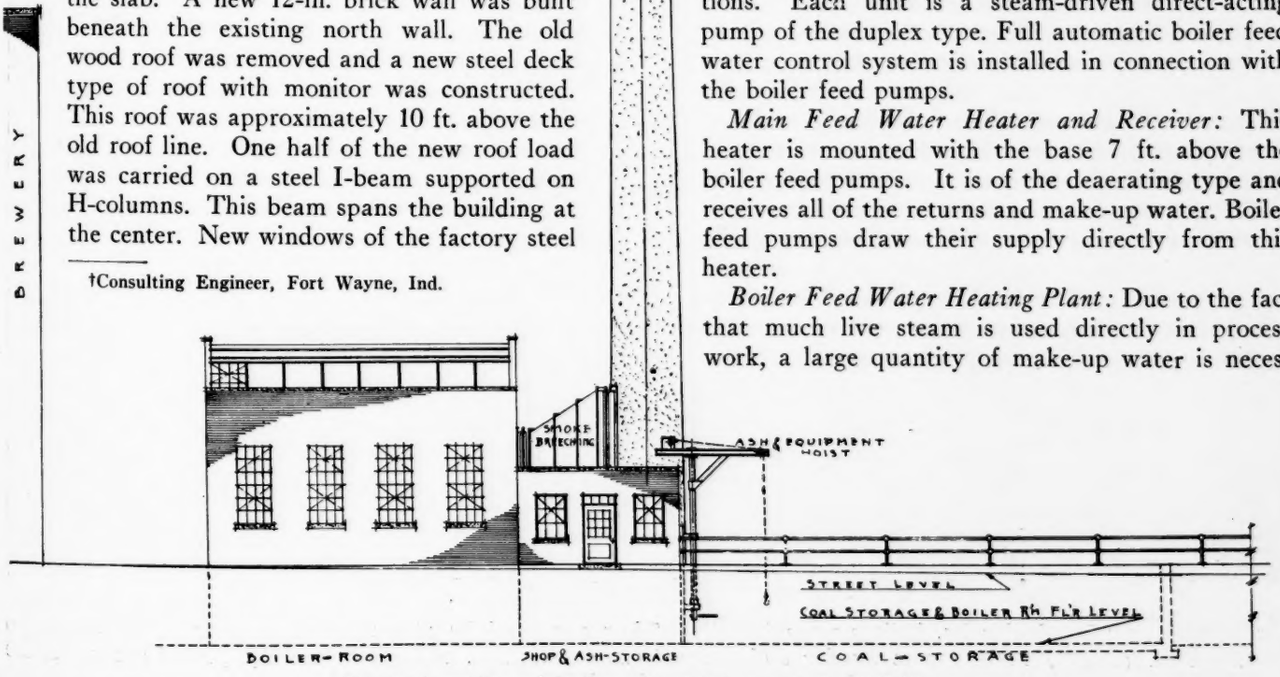
Boilers: Two units, each in its own brick, plastic-lined setting. Each unit consists of a three-drum bent tube water tube boiler built for a maximum working pressure of 250 lb. Each drum is 42 in. in diameter, and the boilers are set with the lower drum 9 ft. above the floor line. Space is provided for superheaters in case the management decides to install turbines for generating electric power. A complete new welded steel breeching connects the boilers with the concrete chimney. The breeching opening in the chimney was enlarged and the chimney was gone over from top to bottom. The nominal rating of each boiler unit is 200 boiler hp.

Stokers: Each boiler unit is served by an underfeed stoker of the heavy duty type. Each stoker is capable of being operated continuously at 400 boiler hp. and for peak loads of 500 boiler hp. Stokers are of the unit type with steam turbine drive for operating the ram and fan. They are automatically controlled from the boiler pressure.

Boiler Feed Pumps: Two boiler feed pumps, each capable of serving the plant under full-load conditions. Each unit is a steam-driven direct-acting pump of the duplex type. Full automatic boiler feed water control system is installed in connection with the boiler feed pumps.

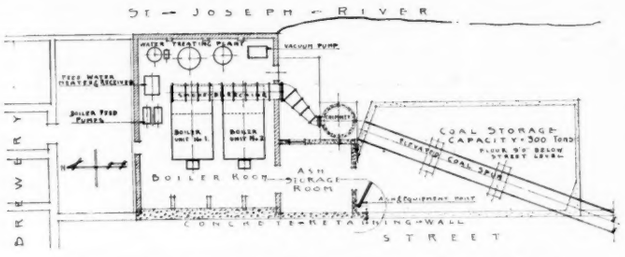
Main Feed Water Heater and Receiver: This heater is mounted with the base 7 ft. above the boiler feed pumps. It is of the deaerating type and receives all of the returns and make-up water. Boiler feed pumps draw their supply directly from this heater.

Boiler Feed Water Heating Plant: Due to the fact that much live steam is used directly in process work, a large quantity of make-up water is neces-



West elevation of boiler plant. Brewery is at left

sary. The water used is taken from wells and has a hardness of approximately 25 grains. In order to properly treat this water, a softening plant of the hot process lime and soda type was installed. Plant consists of a chemical mixing tank, a softener and a filter, and necessary pumping units. The treated water goes directly to the main feed water heater and receiver.



Arrangement of apparatus in boiler plant

Main Vacuum Pump: All low-pressure returns, including those from the heating systems, discharge directly into the new main vacuum pump which is located in the boiler room. This pump discharges into the main heater and receiver. Pump is automatic and is of the electric motor-driven duplex type.

General Boiler Room Equipment: The main steam header and connections from the boilers are welded. All valves and equipment are made accessible to the operators by means of a system of permanent steel walkways, stairs, and ladders. A complete system of boiler room instruments is now being installed.

Coal and Ash Storage

South of the boiler plant building is the coal storage bin. It is built of concrete and is served by an elevated coal spur. Storage capacity is 300 tons. Coal is transported to the boiler room in special hand-propelled coal cars. The concrete ash storage room is located between the boiler room and the coal storage. Ashes are stored in special cans which are elevated to ash trucks at the street level by means of a specially designed crane of the jib type. Above the ash storage is the shop which is constructed of brick and provided with steel factory sash windows and steel doors.

Steam Distribution

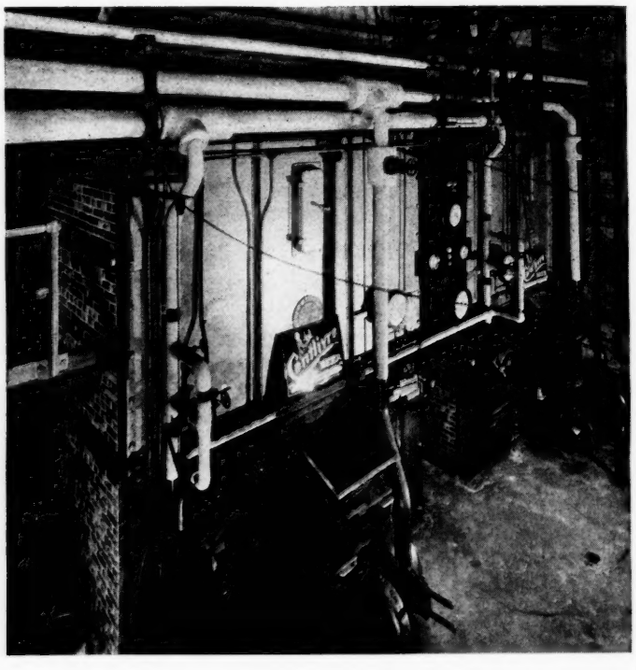
During the rehabilitating process of the brewery proper, the old steam piping system was utilized insofar as possible, but it was necessary to design and install new steam lines from the boiler plant to the brewery and through the tunnel to the bottling works and from there through conduit to the remodeled office building. These lines also serve the new heating system in the bottling works and in the brewery proper.

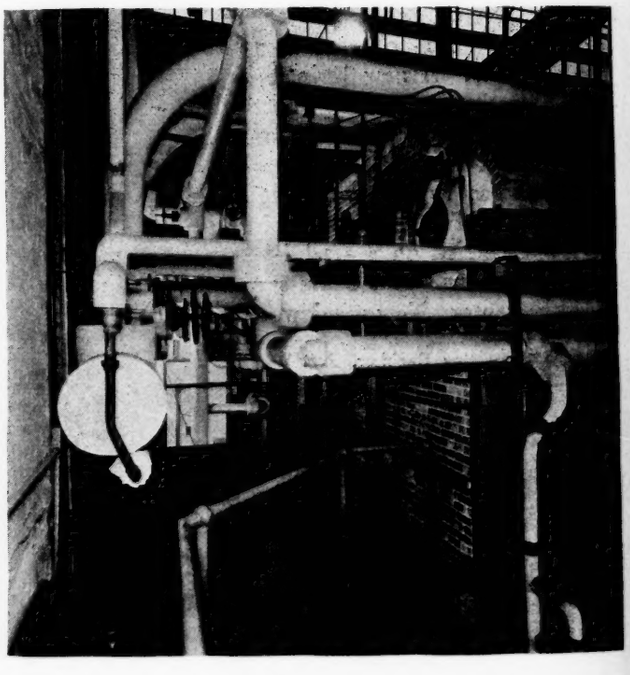
Modernized Heating System

A new heating system was designed and installed in the bottling works. The system of steam circulation is of the low-pressure vacuum type. Heat is supplied by means of unit heaters located overhead. The brewery proper is also heated by means of new unit heater installations.

Boiler Room Economy

The entire present load is carried on one boiler unit operating at approximately normal rating. An average overall efficiency of stoker and boiler of approximately 75% is indicated. A cheap grade of Indiana coal is used.





(Left) Two new 200 boiler hp. boilers were installed. They are fired by steam-driven stokers burning a cheap Indiana coal. (Right) Main steam header and connections are welded. All valves and equipment are accessible to operators by permanent steel walkways, stairs and ladders.

ON THE FIRING LINE

Practical, usable, and result-getting methods and experiences in getting business

Contractor Sells All Kinds of Modernizing to Old Customers

Avoiding cheap competition and making frequent personal calls on a selected list taken from its 6,000 customers has enabled a 35-year-old company of heating and ventilating contractors and engineers to keep busy during the past year on modernization work. Unlike some others, this company does not offer any particular specialty item as an entree into larger orders; it feels out business possibilities, then supplies whatever fits the conditions encountered.

The method employed in this case favors the survey, although haphazard survey opportunities are not solicited. There is no indiscriminate doorbell ringing. Any heating and ventilating organization that has 35 years' experience behind it necessarily has accumulated a steady clientele of building owners, superintendents, engineers, and others able to place orders.

This firm believes, though, that due to general conditions the great bulk of the customer list should be eliminated as prime prospects for new work; some have lost control of buildings they formerly owned, while others, though still in control, cannot meet their obligations, and still others have so changed their connections in such a manner as no longer to represent good prospects. Nevertheless, sifting of the list is bound to reveal at least an ample roster of names of those who continue to place business and prefer their regular contractor.

Personal calls by members of the firm and mechanical inspections, or surveys, bring out weak points about apparatus in use and suggest supplementary equipment that can be added as modernization to effect operation savings that will return to owners savings within two years greater than the cost of the equipment.

Gas boilers assist in modernizing basement

Among modernization apparatus offered on this basis are automatic boiler feed water controls, low-water cutoffs, gas conversion burners and gas boilers, oil burners and stokers, condensation pumps and receivers, steam traps, air conditioning of several classes, and insulation. The selling policy in use here is considered preferable to adhering to some particular class or kind of equipment, such as special automatic burners to the exclusion of what might be termed competitive kinds. Thus, if owners like gas instead of oil, or oil instead of coal as fuel, the modernization need can be fulfilled.

Practically all the work in progress on this contractor's engineering drafting boards or in his shop is modernization. On new construction projects there is considerable competitive bidding and these yield little profit. Personal surveys made for old, regular customers, on the other hand, produce smaller but more profitable contracts with very little competition.

It is their opinion that fitters can be of service by keeping their eyes open to possible modernization needs in buildings entered on call. If they report such needs to their foreman and he in turn transmits the information to the partners, solicitation follows and a fair amount of work closed.

Firm—Bowers & Co., Philadelphia, Pa.

Consulting Engineer Concentrates on Air Conditioning

Air conditioning is held by one consulting engineer to offer the most attractive class of modernization business now available to heating and ventilating men. Hence, he devotes most of his attention to banks and office buildings as the favored classes of structure to modernize.

Old customers and architects are the best prospects. As before, the bulk of the work now in progress reached the engineer by way of architects' offices. When these assignments are slack, a representative of this engineering firm, himself an engineer, calls on office building and bank superintendents and managers of real estate departments.

This engineer has to his credit an outstanding air conditioning installation in a local bank-owned office building of 33 floors with every room in the structure conditioned, and said to be the only completely air conditioned office building in his city. Already this installation has been the means of bringing to him orders for conditioning several other bank buildings.

A point is made by the engineer that preliminary

reports frequently are made in modernization solicitation, although detailed plans and specifications never are offered speculatively. This indicates the survey method of obtaining fresh contracts and is the method chiefly used to secure assignments that do not come from architects. The equipments of manufacturers who offer free plans and specifications to building owners are ordinarily not specified, since this firm believes that such free service is contrary to the interests of the professional consulting engineers.

This engineer finds considerable work in relatively new buildings. For example, in one building wherein air conditioning did not extend to street-level stores originally, supplementary conditioning was designed for stores as they were rented. This introduces a further point that retail shops now appear to offer excellent air conditioning prospects for modernization. Data can be introduced to show increased retail sales in conditioned stores, figures so conclusive that there are few shopkeepers who cannot be interested in conditioning.

Another favorite project is installing concealed radiators, this engineer specifying concealment whenever possible. Better appearance and unimpeded rentable floor space as contrasted to exposed and space-consuming radiators appeal to managers and owners. Several modernization projects of this sort have been handled.

This engineer is partial to automatic burners of all kinds and has carried out many boiler room modernization assignments. As this organization is concerned with mechanical equipment of all varieties, concentration of personal calls on only the better class of the city's large buildings yields sufficient work to keep the force occupied. No widespread canvassing is used, but personal contacts are maintained with selected old customers and owners known to be financially sound and appreciative of modernization.

Firm—H. Berkeley Hackett, Philadelphia, Pa.

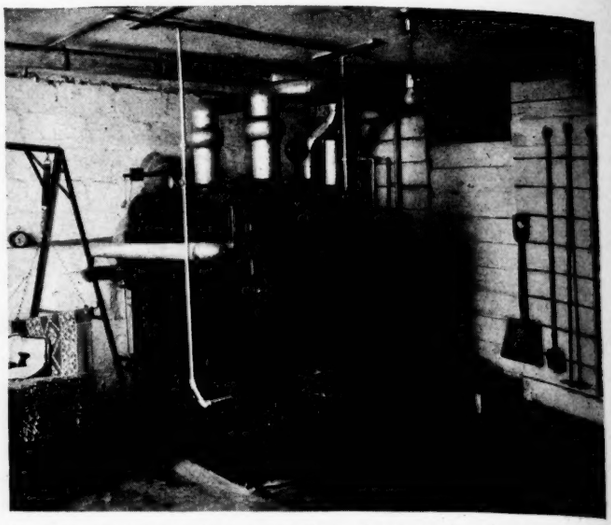
●

Contractor Specializes in Magazine Feed and Gas Boilers for Modernizing

Form letters, reply postcards, personal calls, and neighborhood canvassing following mail circularization are used by a second-generation heating and ventilating contracting firm to secure modernization work, results being gratifying. If there is one class of apparatus specially favored over others it is magazine feed heating boilers. The present manager has such a boiler in his own home. By showing it to others in his suburb, coupled with literature mailing, he has sold duplicate installations to a large number of other residents.

Modernization selling is best accomplished through the physical survey, in the opinion of the manager of the firm. Recently reply cards were sent out to several hundred selected prospects offering survey services. The return approximated 3% and sufficient orders were received for varied kinds of modernization to well repay the effort.

In another case a series of three letters featuring magazine boilers was sent out by the boiler manufacturer to the contractor's mailing list. Some 30 replies



Contractor's sales campaign uncovered considerable interest in magazine feed boilers.

indicated purchasing interest. Personal calls brought in five sales. Pursuing the cooperative campaign, the remainder of the list was canvassed and subsequent sales were made in this way.

This concern also handles considerable business in FHA-insured loans. Although timidity of prospects prevents their doing more modernization business through the government plan, the FHA has proved helpful in numerous cases and is encouraged whenever conditions warrant.

This contractor, like most others, finds his best prospects in his old-customer files. Best results are achieved, according to the manager, by friendly visits to previous customers. During the conversation the advantages of equipment surveys are suggested. Proposals that follow are based on the type of defects found and the opportunities for modernization that will produce fuel economy, labor saving through automatic control, better appearance, and such factors. It is held that such calls also pay dividends to contractors.

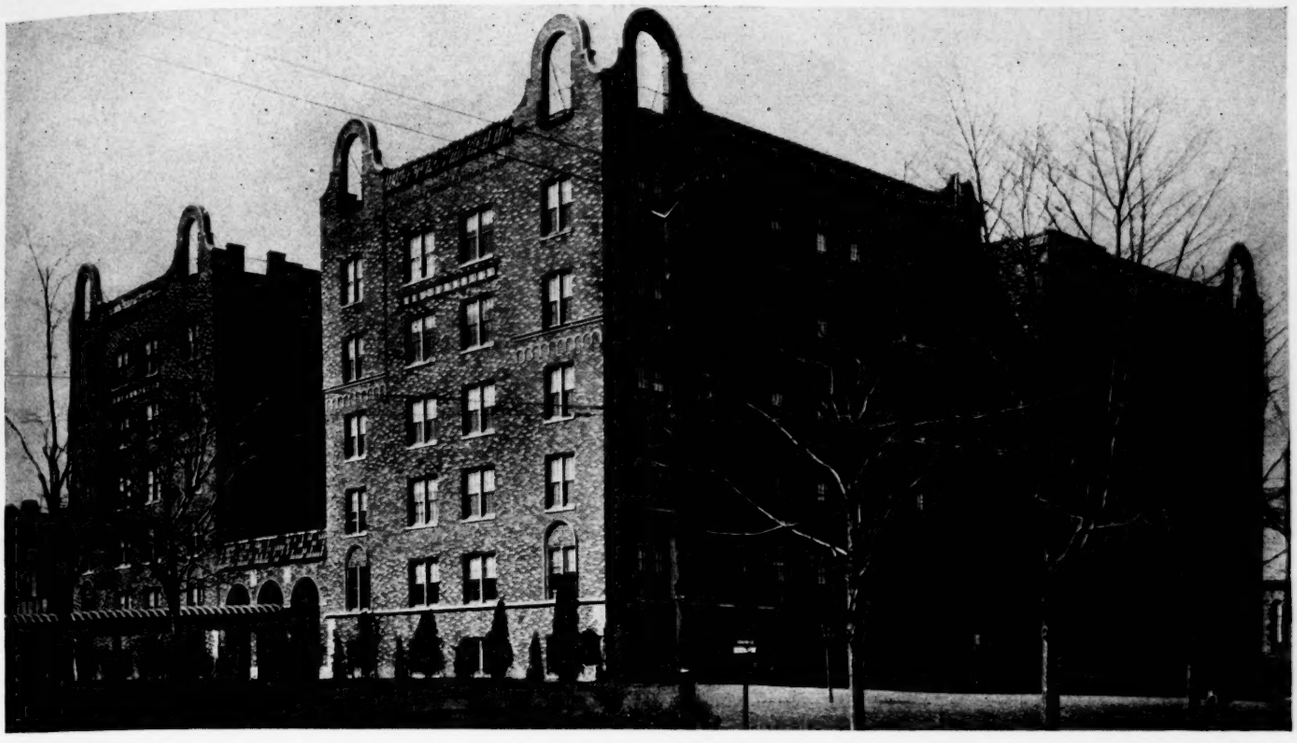
Commercial and mercantile types of buildings provide good modernization prospects. There is available an important amount of replacement heating business, particularly in boilers, valves, and insulation. Most of the voluntary inquiries are from owners of worn out plants. Such boilers usually are replaced with modern units, particularly magazine feed and gas-fired types.

Considerable supplementary work, such as making old chimneys tight, enlarging flues, redesigning breechings, replacing smoke pipes and insulation is encountered. Inspection of numerous buildings reveals general conditions of this nature to be unusually bad. Heating modernization should start at the chimney, according to this contractor.

This contractor annually cleans more than 100 plants, removing soot and scale. This brings the contractor and his men into many basements and thus into a position to view existing equipment with reference to modernizing prospects.

The two most influential sales factors leading to modernizing contracts are, first, knowing what's needed, and, second, enjoying the confidence of the prospect.

Firm—A. McClintock & Sons, Philadelphia, Pa.



Modernizing mechanical equipment in this apartment house ended complaints of tenants and resulted in 100% rentals.

Find the Facts and You Find Modernizing

There is a tremendous amount of modernizing to be found in apartment buildings. It must actually be unearthed, however, for the opportunity is seldom apparent without search. If there are complaints, there is work to be had. Here is a story of how one man found modernizing business by uncovering what was necessary and proving that it was worth doing.

WHEN neither tenants nor owners are fully satisfied with the way mechanical equipment is functioning, there is a modernization job to be done. With equipment in the state of development that it is today there is no reason why any tenant of an apartment house should have to complain of a lack of hot water or absence of heat due to equipment or operating faults. Neither should an owner have to stand the loss of tenants moving out for either of these reasons although he may be paying plenty in the way of fuel bills. When there are complaints by tenants or when the fuel bills seem high what is needed is a real checkup to get at the actual facts—not a mere perfunctory handling of the complaint or a resignation to the necessity of keeping on paying for extra fuel.

All of us know about these facts, know how valuable a really well conducted survey can be to a building owner or operator. However, the owner or operator does not always know it.

He does know when he has tenant complaints but is often without adequate facilities to check up to get at the real causes. He has no instruments for learning how good combustion is being obtained, whether or not there is adequate draft, excess air, whether the operating procedure is really economical, whether piping and accessories are in good repair.

He also knows full well that next to taxes fuel costs represent the major expense of operating the property. The trouble is that he usually has no worthwhile yardstick by which to judge whether the fuel costs are reasonable.

Under these circumstances it is really surprising that more owners or operators do not insist on surveys being made. They have everything to gain and little if anything to lose, provided the survey is really honest and is sensibly conducted by a competent person. The fact remains that surveys are not always welcomed but must actually be "sold" to the owner. A strange state of affairs.

Some operating firms, however, reverse this practice and get disinterested outside advice even before tenant complaints have a chance to get chronic. Others follow up complaints carefully as they arise, and make a real effort to correct the conditions. In general the ones who follow one of these procedures show better results and smaller vacancy percentages than do those who follow the older practice of letting tenants just keep on complaining.

The heating man who is keenly alive to modernizing possibilities will be at least as forehanded as he wishes the operating firm were. He will be actively looking for the live owner or operator who does not wait for

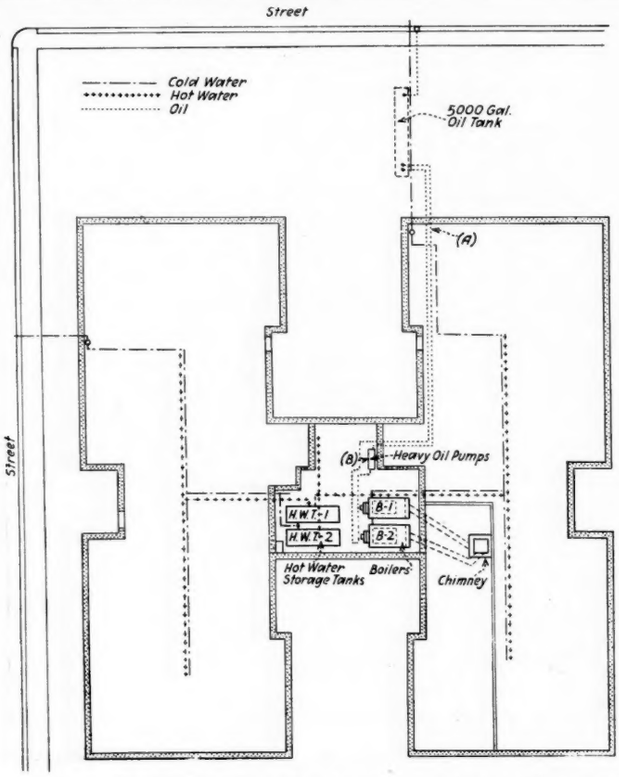


Fig. 1. Basement plan showing mechanical equipment before changes were made.

actual trouble but who does know that heat and hot water cost money. Moreover he will be so set up that he is ready to go on the job, analyze conditions, and come out with intelligible conclusions and recommendations.

When the heating man and the owner or operator really get together, the one making the study and the other satisfied that it is correct, there is likely to be a modernizing job, just as there was when a survey was made in the apartment house at 399 Lincoln Ave., Orange, N. J.

Here is a house of five stories with 88 apartments and 231 rooms, built in 1927. Its history is similar in many ways to that of so many houses built at that time. During the depression it fell on evil days, failed to earn, was only about 50% rented. A mortgage against it was foreclosed, and it came into the possession of its present owners. In March, 1933, C. J. Allers & Co., East Orange, N. J., became the operator and manager of the property. This firm likes to know the condition of the properties under its management and makes it a point to keep informed. In many cases it carries on investigations even before taking over management in order to know just what to expect. These studies not only include physical inspection of the equipment but also the gathering of opinions from tenants. Such thorough studies have been found well worthwhile.

No Capacity Shortage

When the survey took in the heating and hot water systems it was found that the equipment in the basement was located as shown in Fig. 1. The two steel boilers are rated at a total of 25,000 sq. ft. E.D.R. on coal or 31,900 on oil. The rotary burner, using No. 6 oil, can reasonably be expected to handle 22,000 sq. ft. of E.D.R. Total heating load calculated to 10,641 sq. ft. and hot water heating was estimated as equivalent to an additional 4000 sq. ft. of E.D.R., making a total load on the boilers of 14,640 sq. ft. The two hot water storage tanks each 48 in. in diameter and 16 ft. long provide a storage capacity of 3000 gal. These figures indicate that so far as sizes and capacities go the plant should be expected to function as intended. In fact it appears that there are enough reserve allowances on capacities in all directions so that any possible errors in estimating are amply covered.

These facts could not form the basis for explaining why tenants complained that there was "no hot water" or for high fuel consumption. Further and more intensive studies were indicated in order to find the causes of these complaints.

A Hot Water Problem

Tenants generally reported that the hot water was

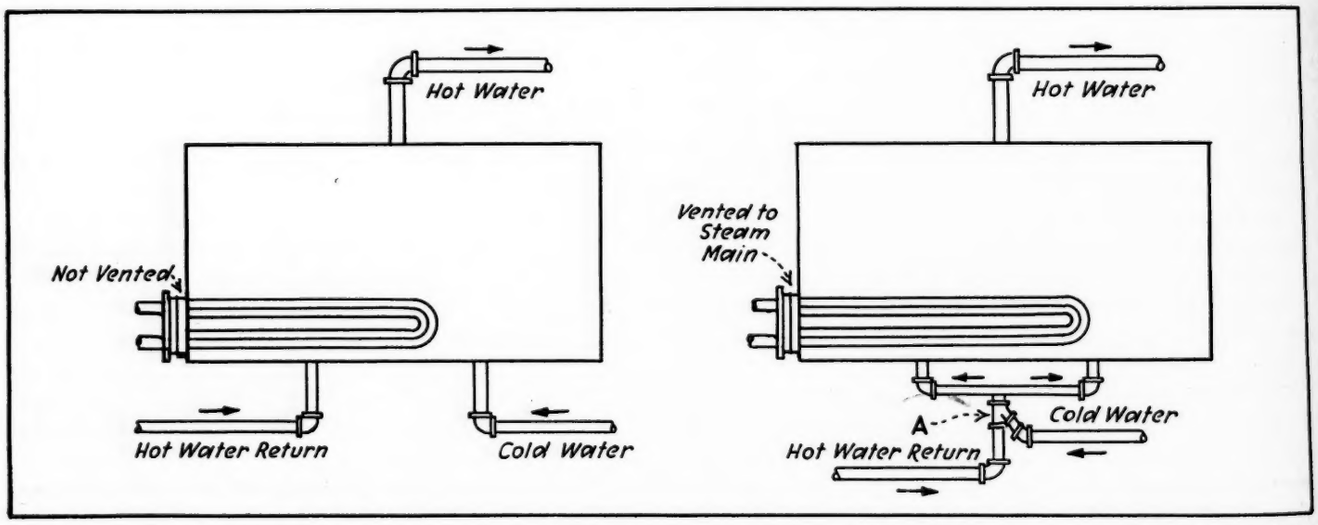


Fig. 2 (Left). Piping arrangements of hot water storage tanks which resulted in lukewarm water and low pressure.
Fig. 3 (Right). Corrected piping which eliminated air binding in submerged heating coils and short circuiting of cold water in storage tank.

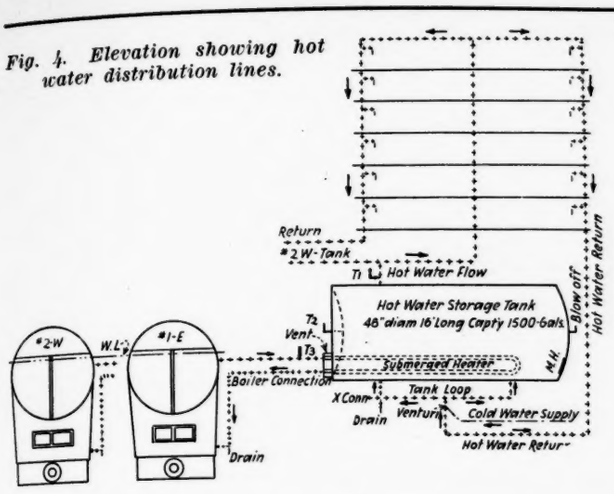


Fig. 4. Elevation showing hot water distribution lines.

never more than lukewarm and came out at faucets slowly. As the capacities checked up with the figures usually used for similar buildings it was apparent that the trouble must be due to the detailed piping arrangements. Examination brought out the fact that the submerged coil heaters were not air vented and that the piping connections at the bottom of the tank were as shown in Fig. 2. As the piping was arranged to provide for a circulating system with a supply main at the top of the building feeding down to fixtures and returning to the tank, lukewarm water could be accounted for by slow gravity flow in the circulating piping, by the practice of feeding the cold make-up water directly into the storage tanks, and by air collecting in the submerged coils.

Air was disposed of by tapping into the top of the coil header near the tank and leading a vent line to the steam main. Any air which came over with water from the boiler is thus led into the steam main and finds its way out through the heating system vents.

To eliminate the other possibilities the piping at the bottom of the two storage tanks was rearranged as shown in Fig. 3.

At the point "A" in Fig. 3 an ordinary Y fitting was used. This arrangement gives something of an injector and mixing chamber effect. Each time hot water is drawn off the system, cold water flows in to take its place and helps circulation by drawing along some of the water from the hot water return lines. This action serves to speed up the gravity flow in the circulating piping and also to warm up the cold water. Thus water entering the storage tank is above supply temperature, and enters the tank at two points instead of one.

While these changes were being made, suitable cross connections were also put in between the two submerged coils and between the two storage tanks so that operating flexibility was increased. When completed the piping was arranged as shown in Figs. 4 and 5.

Since these changes were completed there has been no trouble in keeping an ample supply of hot water and tenant complaints have stopped.

Poor Combustion is Found

In order to check on the combustion it was necessary to make a test on the operation of the burners. This test showed that only 6% of CO_2 was being obtained, indicating poor combustion and giving the essential clue to why fuel consumption was out of line. It remained to find out why combustion was so bad.

As shown in Fig. 1 there were two oil pumps located close to the burners. These pumps produced an oil pressure at the burners from 30 to 45 lb. when operating at full speed, and the pressure fluctuated. As this pressure was lower than that usually encountered it seemed necessary to try to find what was causing it. Examination of the oil circulating piping showed that the equivalent length of pipe from the oil storage tank to the pumps was about 200 ft. The suction line was of 2 in. and the return line 1½ in. The two pumps were set in parallel with the usual bypass arrangement to permit either to be used while the other was available for stand-by. Evidently there was a large frictional resistance in the piping which was too big a load for the pump to handle.

To correct this condition it was decided that the two pumps might be operated in series, making the one act as a booster to the other. Suitable bypass piping would still let either pump act without the other in case of emergency.

Consequently, one pump was left in position while the other was moved to point "A" of Fig. 1 just inside the building wall. At the same time the preheater was relocated and its capacity increased. When these changes were made the piping appeared as shown in Fig. 6. A high-low pressure control was also installed in order that semi-automatic operation of the burners might be secured.

Following these changes an oil pressure up to 100 lb. could be obtained readily at the burner. The temperature of the oil leaving the preheater was increased, CO_2 percentage picked up to normal, and fuel consumption showed a substantial drop.

An estimate based on normal steam and hot water requirements was used to set up a yardstick of proper fuel consumption and when actual consumption for the year preceding the changes was compared with this normal it was found to be so much greater that a possible saving in fuel cost was indicated which would liquidate the cost of modernizing in only one season. Actual results indicate that the estimates of consumption and saving are being closely approached.

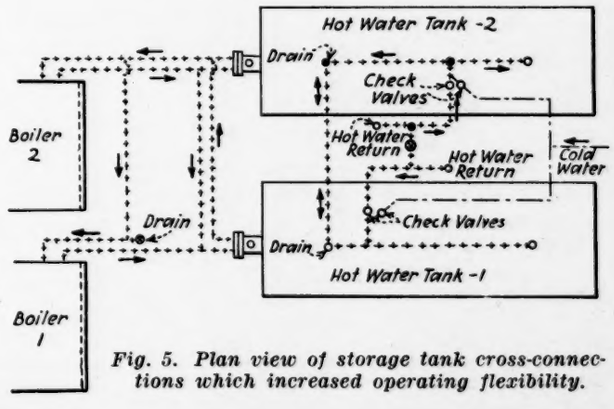


Fig. 5. Plan view of storage tank cross-connections which increased operating flexibility.

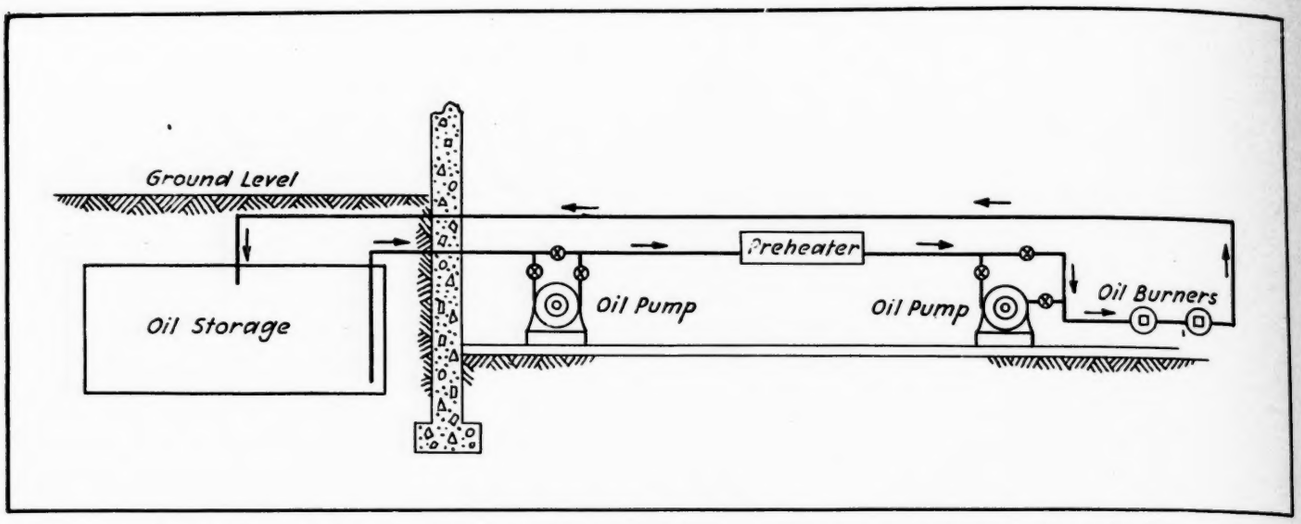


Fig. 6. Placing the oil pumps in series resulted in increased pressure and improved combustion

Results

Now let us see what has been accomplished. On the side of the owner, tenants are satisfied with the hot water service and he has secured an improved plant at a total cost such that it can be financed out of savings. Moreover, at the present time the building is 100% occupied and the revenue from tenants is more than double what it was when the present management took it over. Modernizing the heating and hot water equipment was not the only cause of this situation but certainly it played an important part.

On his part the heating man[1] obtained work satisfying not only for itself but also for the prospects which it opens up for more to come. Moreover he has demonstrated the truth of the statement that there is modernizing work to be had when the facts are really brought to the attention of enlightened owners and managers.

[1]V. C. Kylberg, a practicing engineer specializing on modernizing work, and who furnished the information on which this article is based.

Copper Patch Welding of Cracked Boiler Sections

REPAIRING of cracked sections by welding copper patches over the cracked area is a fairly recent development in boiler repair work. It has been found to be an excellent method of saving cracked boiler sections, especially where the crack occurs in large flat areas. When this type of crack is repaired by bronze welding there is a tendency for the crack to extend or branch out due to the expansion and contraction of the section during welding.

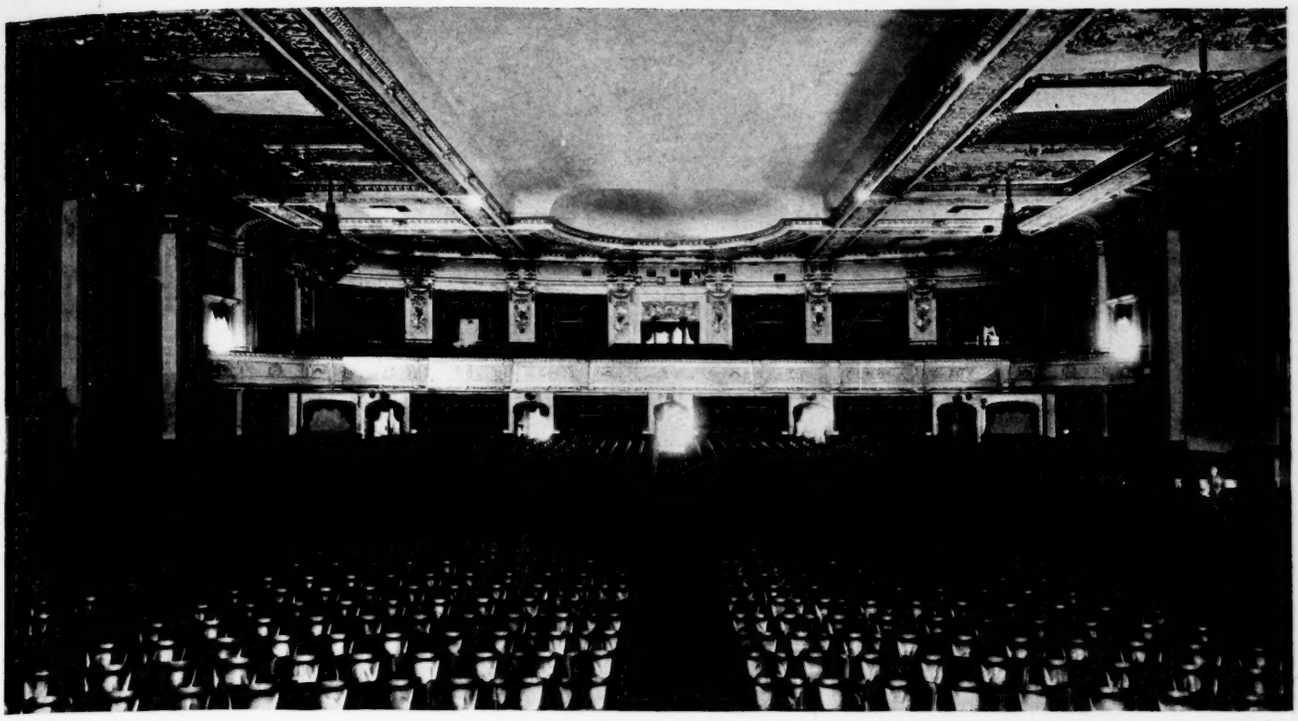
The procedure in preparing the section for patch welding differs from the procedure used in bronze welding. The patching material should be about a No. 16 gauge sheet copper cut into a strip wide enough to cover all the irregularities in the crack. It should extend about ½ in. outside of the extreme edges of the crack and should be long enough to extend at least 1 in. beyond the ends. A 3/16-in. hole, if drilled as near as possible to the end, will serve to prevent the crack from extending further into the section. The surface of the cast iron around the edge of the patch where the welding will be done should be cleaned by scraping or grinding.

The welding should be done with a medium or small size tip and using about a ⅛-in. rod. The weld itself should be thin, from ⅛ to 3/16 in., to prevent too great expansion. It should be about ½ in. wide so as to lap well over the edge of the patch but not over the crack. The welding should not be stopped until the entire length to be welded is completed.

Special precautions should be taken where the crack runs through sections of various thicknesses. If it extends through a light section into a heavier section, the welding should be started in the light section and towards the heavier section. If it starts in a light section, runs through a heavy section, and then into a light section, welding should be started in the light section and carried to about the center of the heavier section. A new start should then be made at the end in the other light section so that the weld will finish in the center of the heavy section where the other weld stopped.

Where it is impossible to cover the entire crack with a single patch, as much as possible should be covered. This patch should then be welded and the weld carried over the crack. Another patch should be started from the other end of the crack and welded up to a point about ½ in. from the end of the first patch. The space between the two patches is then filled in by bronze welding to completely seal the crack.

Where the patch is large, holes should be drilled through the cast iron underneath the patch. This is done to allow the water to get through to keep the copper cool. This is important where the patch is exposed to the heat of the fire.—*Oxy-Acetylene Tips*



Interior of Tiffin Theater. This air conditioning installation was largest made in a Chicago theater during 1934

Five Unusual Theater Air Conditioning Installations

CHICAGO theaters paid more attention to air cooling last season than in any previous year. Over 20 theaters were modernized with air conditioning. One of the most striking features of these installations is that most of them have been made in theaters from 10 to 50 years old.

There is no doubt that many of the older theaters have been forced into installing cooling systems because that was the only way in which they could meet the competition of the newer theaters which have air conditioning installed during construction or shortly afterwards. The public, instead of regarding air cooling as a novelty, has come to expect it in the theaters it patronizes during the summer.

As was to be expected, each installation presented difficulties and problems not encountered in the others. In some cases, all that was necessary to install air cooling was to place cooling coils in the plenum chamber. In others, it was necessary to practically rebuild the entire system. Occasionally, it was found to be more feasible to install an entirely separate system for cooling, leaving the heating system as it was.

Naturally enough, there were a number of installations made which were different and for that reason more interesting than the typical installations. A study of some of these will indicate the problems the air conditioning engineer encounters in installing cooling in a theater. The five jobs which follow are unusual in the difficulties encountered and in the ingenuity used in solving the many problems.

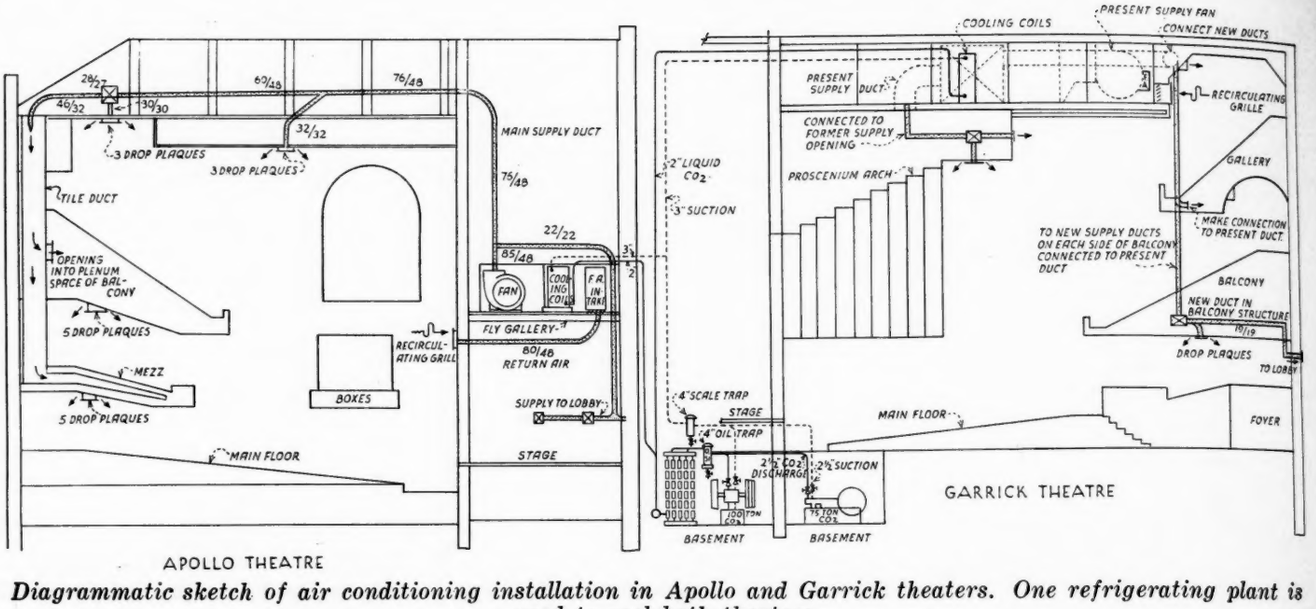
A Twin Theater Installation

It is rare that an engineer encounters the situation presented in the case of two of the oldest Chicago Loop playhouses, the Garrick and the Apollo. These two theaters, which were recently acquired by a large movie chain, are practically side by side. This feature was seized upon as a method of cutting the cooling costs. A common refrigeration plant is used to cool both theaters. This plant, consisting of two CO_2 compressors, 75 and 100 tons, is installed under the stage of the Garrick Theater.

The Garrick, built in 1891, has 1000 seats. Heating and ventilating was accomplished by means of a downfeed system from the proscenium arch. When cooling was installed this system was abandoned and seven new supply ducts used in its place. This was done to assure positive distribution and to avoid stratification. The ceiling grilles over the gallery, supply outlets under the gallery, and grilles in balcony and lobby are connected by new ductwork to the cooling system.

Recirculation is obtained through a hole cut into the supply fan intake over the gallery. Adjustable dampers on both the fresh air intake and at the recirculating grilles permit the regulation of both the inside and outside air through the dehumidifier to obtain proper conditions within.

In the Apollo, no change was made in the heating system. The cooling coils and fans are located on the fly gallery in back of the stage. A 1¼-in. liquid and



Diagrammatic sketch of air conditioning installation in Apollo and Garrick theaters. One refrigerating plant is used to cool both theaters

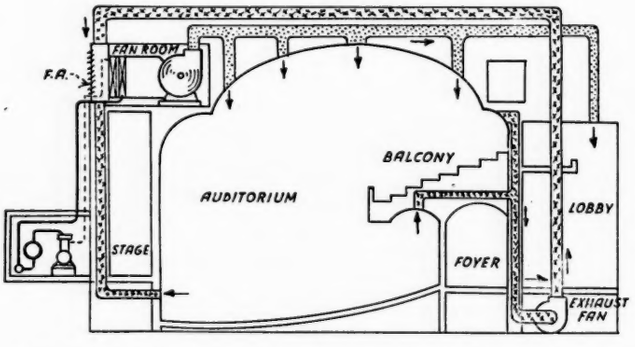
a 3-in. suction pipe connect the coils with the compressor.

The supply air duct was run vertically to the attic and then branches out to five ceiling outlets, the end terminating in a masonry riser at the extreme corner of the building. This riser in turn connects with the balcony and gallery structure which serves as a plenum chamber. Five supply openings are cut through the ceiling under the balcony and mezzanine. Recirculation is through a duct suspended under the fly gallery floor with one end connected at the fresh air side of the housing. The air is drawn in from the auditorium through a hole cut through the stage wall leading to one of the old boxes.

Tiffin Theater

The installation made in the Tiffin Theater was the largest in a Chicago theater during 1934. It is unusual in that it was necessary to construct a small building next to the theater to house the two 75-ton freon compressors.

The liquid and suction lines from the freon compressors run up along the wall to the cooling coils which are in the fresh air intake. The present 57,000-c.f.m. fan formerly supplied air to two large grilles in the center of the ceiling dome and to two front side wall outlets.



Diagrammatic elevation of air conditioning apparatus and ductwork in Tiffin Theater

The front side wall outlets are not used now. Three front ceiling supply openings were made, in the old duct in the attic. Two of the large openings of the former main supply opening are used, but partly restricted. On each side, new extension ducts were built from the two former branches to the rear of the balcony and lobby. A total of 12 supply outlets are in the ceiling of the auditorium and two in the lobby. Each opening is equipped with drop plaques, to diffuse the downward supply of cool air.

Recirculation is made possible by reversing an auxiliary fan used previously for blowing warm air to the rear of the balcony, main floor, and foyer. The former supply grilles are now used for recirculating the air. Since this 42,000-c.f.m. fan is at the extreme end of the building from the fan room in the basement, a duct of approximately 14 sq. ft. in area was run up along the outside wall to the attic and then to the dehumidifier. The total length is about 140 ft.

A return air arrangement for the front of the auditorium was made by installing four grilles at the side of the stage platform. A tunnel under the floor was then connected to a vertical shaft in the corner which directed the air back through the intake and past the cooling coils. There are 20 return air openings in the auditorium.

American Theater

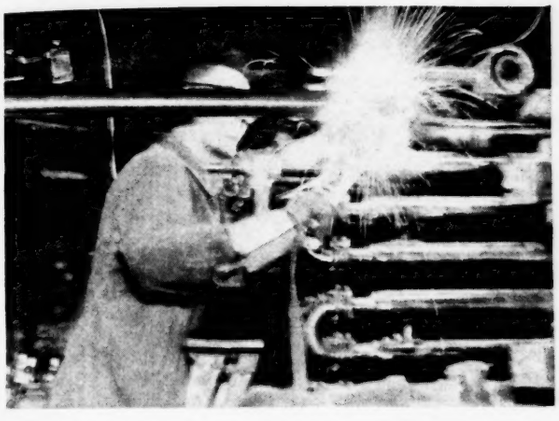
In this theater the engineers were able to obtain a very compact layout of the equipment by utilizing the space formerly occupied by the dressing rooms. This type of layout is not only more efficient from the operating standpoint but also makes servicing easier.

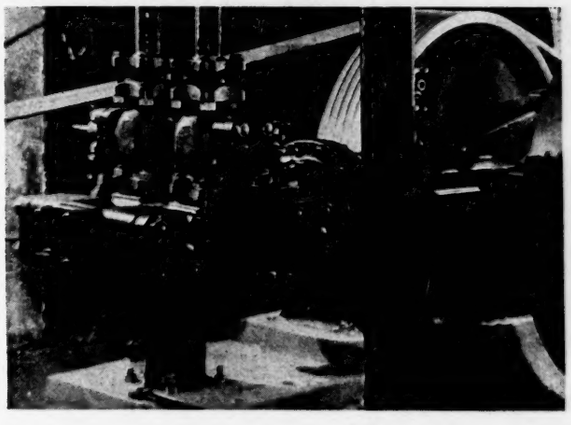
All of the equipment for heating and cooling is located in the old dressing rooms which were under the stage. The equipment installed in these rooms includes an 85-ton CO_2 compressor, cooling coils in the fresh air intake, a new supply fan driven by a 15-hp. motor, and the heating coils which were formerly in the attic.

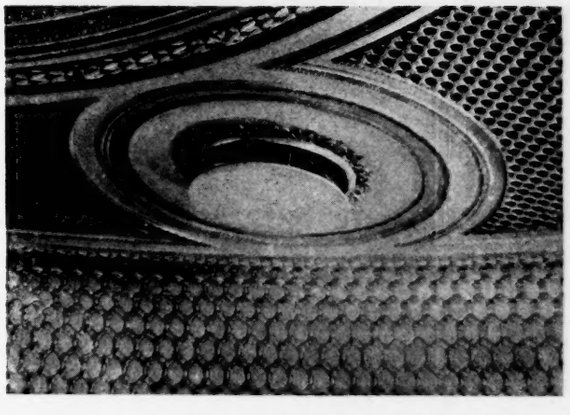
The old floor mushrooms which previously supplied warm air to the auditorium are now used to recirculate

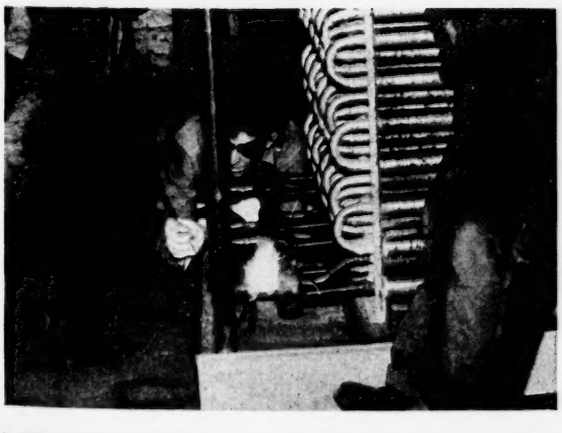
GARRICK

As shown in the picture at the right, the Garrick and Apollo theaters are practically side by side. This feature enabled the engineer to use one cooling plant to condition both theaters. Below is a workman welding an elbow in the main CO_2 liquid supply line. The cooling coils are made of wrought iron pipe with extended surface. To the right of this is shown one of the two CO_2 compressors





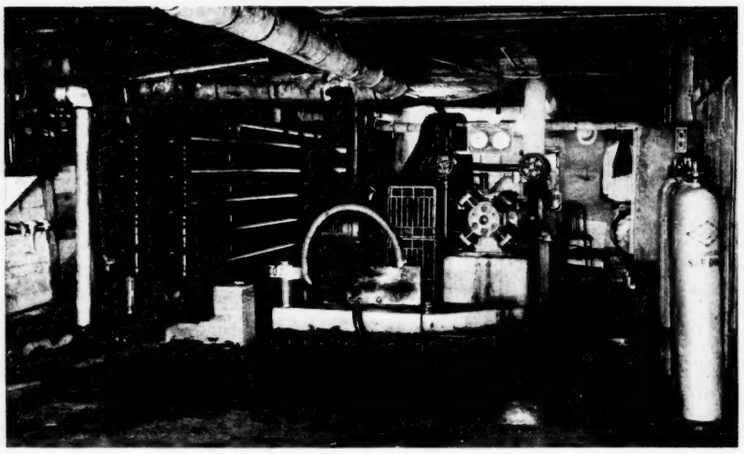


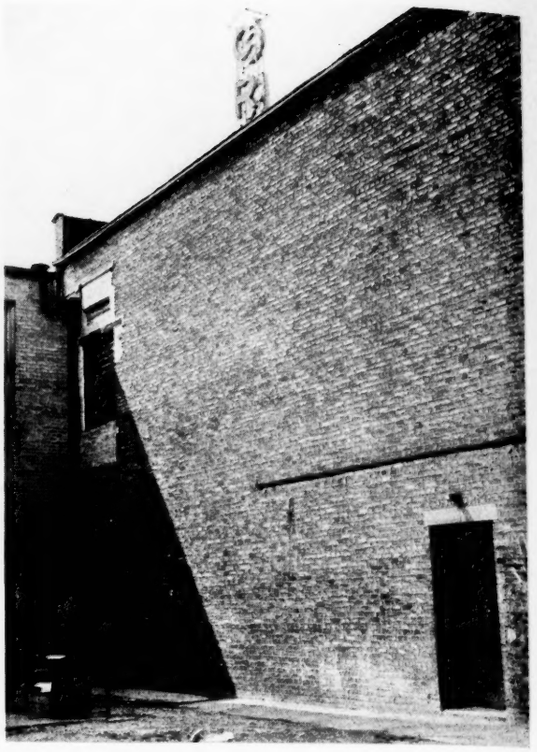


The three lower pictures refer to the portion of the apparatus installed in the Apollo Theater. The upper left hand view is of the cooling coils which were installed on the fly gallery in back of the stage. Picture was taken before the fan and sheet metal housing were installed. Right is a closeup of the main drop plaque in the center of the auditorium. Steamfitter (left) is welding a CO_2 line to manifold of cooling coils

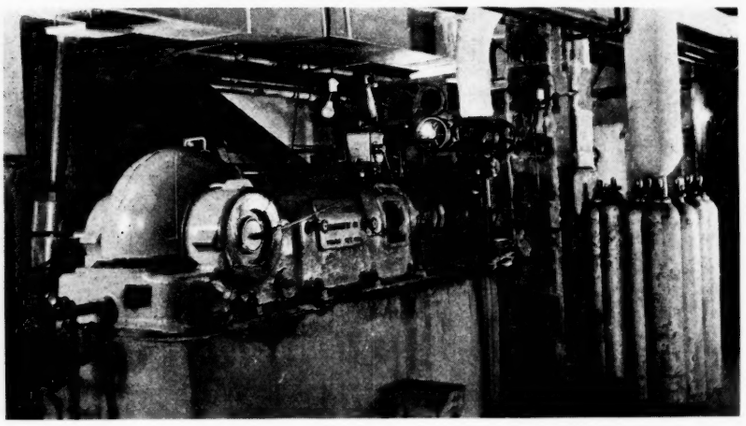
APOLLO

CRAWFORD



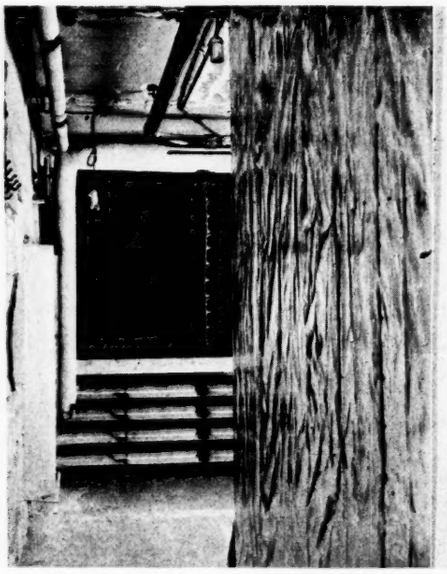


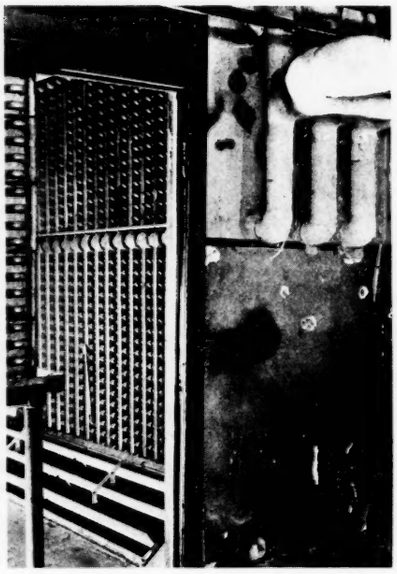
Above and right are two views of installation made in Crawford Theater. In the center of above picture is shown the CO_2 compressor. At left of compressor are the condensing coils. Picture at the right is of the fresh air intake

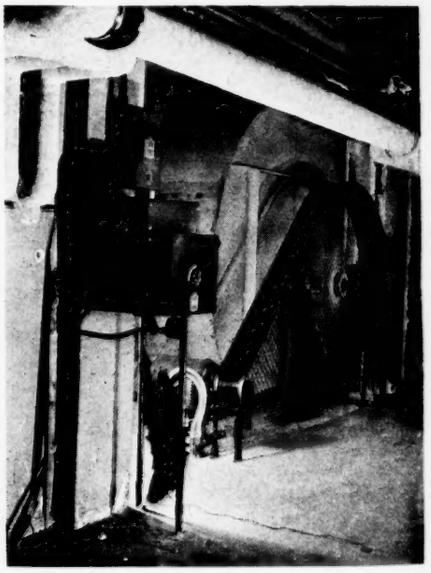


AMERICAN

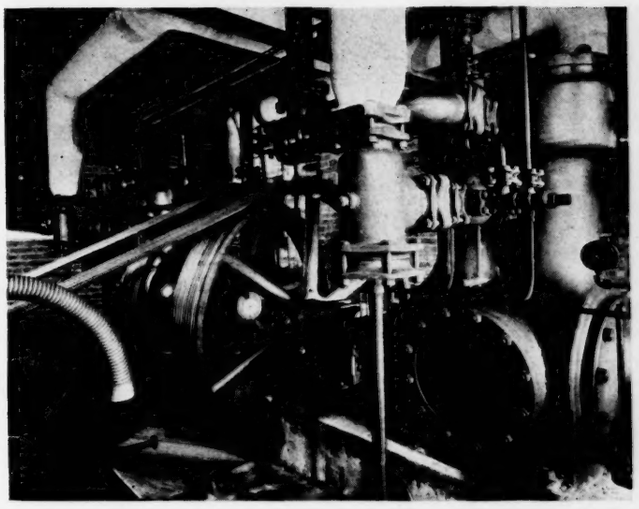
At the left is the 85-ton CO_2 compressor which was installed under the stage of the American Theater. A number of CO_2 supply tanks are standing next to the compressor.







(Left) Fresh air chamber in American Theater looking towards cooling coils. Right hand wall is insulated with metal foil. (Center) Portion of cooling coils is shown at extreme left. At right of these are the cast-iron heating surfaces. (Right) Supply fan which forces the air up through a brick duct to the attic ductwork which carries it to the ceiling grilles



(Left) Exterior of the Tiffin Theater which is cooled by two 75-ton freon compressors. (Right) Interior of refrigerator room of the Tiffin Theater. This room was specially constructed to house the refrigerating apparatus

the air. The cool air is introduced through ceiling grilles from newly installed ductwork in the attic. This ductwork is connected to the cooling coils in the dressing rooms by means of a vertical brick duct which is in the corner of the building in back of the stage. This duct was formerly used to carry the warm air from the attic heating coils to the floor mushrooms.

The American Theater is about 25 years old and seats approximately 1200 people. It is one of the six theaters of the Essaness circuit which were equipped with air conditioning during 1934.

Crawford Theater

The conditions found in the Crawford Theater were just the opposite to those in the American. In this case it was not possible to provide a compact arrangement of the equipment. It was necessary to install the compressor in the basement and the cooling coils on the second floor. These coils are in the fresh air intake passage near the recirculating dampers and the fresh air adjustable louvers. The old duct in the attic was of the conventional type and did not require changing when cooling was added. Two large grilles in the foyer are used to carry the air to the fan room overhead.

Several other facts concerning the cooling systems are worth noting. In several of the theaters a number of small refrigerating compressors have been selected in place of one large unit. The following reasons are given for this decision. First, since a small unit can be automatically controlled, the services of an operator continuously on the job can be dispensed with. Second, since the units operate at their most efficient rate, they are more economical to run.

In some of the theaters it was necessary to use the floor supply openings for admitting the cool air. While this is not the best method of introducing cool air, it has been found satisfactory as long as the air is not overcooled. Suitable precautions must be taken that it is not.

Cooling with Air from Tunnels

AIR drawn from the extensive freight tunnels under the Chicago business district continues to be used as a source of cooling in summer. It has been upwards of 25 years since a restaurant located in the basement of a downtown building first made use of tunnel air for ventilation. This was done by having a shaft dug down to the tunnel through which air could be brought to the restaurant.

Now there are some 30 users of this cooled air. They include a number of restaurants and several theaters. The prevailing temperature in the tunnel is around 55° as an average, rising to as high as 65° in summer. Air temperatures vary considerably at different parts of the tunnels of which there are some 62 miles. With summer conditions found in Chicago, air from the tunnels can be used to provide a 10° to 15° drop in temperature on summer days. For instance, on a day when the temperature reached 105° one large hotel reports that it was able to draw air supply at about 82°.

The popular method of using the air is to pass it through a washer for discharging through the building, although dry filters are employed in some installations. Some mechanically operated oil filters are also in service.

Before issuing a permit to use tunnel air the Chicago Board of Health investigates the portion of the tunnel where the air shaft is to be located. The shaft inlet is not permitted unless that portion of the tunnel is found to be clean and free from dirt.

With the tunnels in use over so long a period it is surprising that there has been no appreciable temperature rise in the air in the tunnels. It is also of interest to note that the low temperature continues in spite of the fairly large number of buildings which make use of the air.

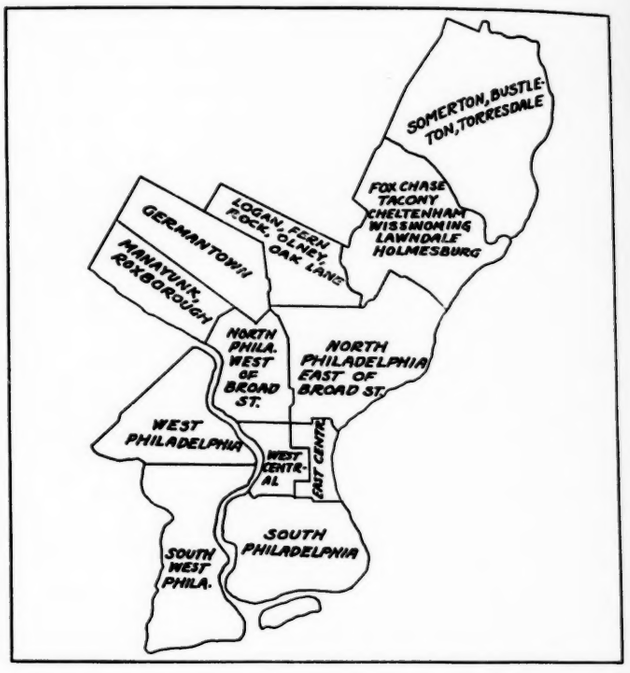
88.8% of Philadelphia Residential Structures Have Central Heat

with 43.9% having hot water systems. In one district 90% of the houses are over 40 years old

INFORMATION covering the type of heating apparatus in residential structures throughout the country has been reported on these pages, and from these data, covering 63 cities, the figures were projected to cover the whole country so far as urban residential buildings are concerned[1]. However, in the Real Property Inventory, from which the data were obtained, none of the cities surveyed was a very large one, so that figures covering Philadelphia, the country's third largest city, are important in that they give us an accurate picture of metropolitan conditions.

Philadelphia's survey was a particularly complete one, and the reports issued were consistently clear and well arranged. This was the first project, so far as we know, in which the reports released to the public showed the data on heating apparatus by structure and not by dwelling units. Figures on the fuel used, however, were, as in other cities' reports, given in terms of dwelling units.

The most striking fact brought out by the survey is that 88.8% of all the residential structures in the city have central heating. Of these, hot water is the most popular, 43.9% of the buildings being so heated. 40.4% are heated by warm air and only 4.5% by steam or vapor. There are 10.2% of the buildings heated by stoves, and only 0.7% with no heat.



HOUSING CONDITIONS IN PHILADELPHIA'S DISTRICTS

Section	General Characteristics	Age of Houses	Condition of Houses
Germantown	Fine Residential, 90% single family	27% less than 15 years old	80% good
Manayunk and Roxborough	Fine apartments, 92% single family concentrated textile	8.5% less than 10 years old, 28% over 40 years old	97% good
Logan, Fern Rock, Oak Lane, Olney	80% row houses	35% less than 9 years	86% good
Southwest Philadelphia	Split between thickly settled and farms. 79% row houses	Half between 15 and 29 years	79% good
West Philadelphia	Numerous apartments High vacancy ratio	59% over 30 years old	67% good
South Philadelphia	Poor residential	41% over 40 years old	67% good
Fox Chase, Cheltenham, Lawndale, Holmesburg, etc.	Newest section, Housing shortage here. Largely row houses	58% less than 10 years old	80% good
Somerton, Bustleton, Torresdale	Sparsely settled. High percentage of free owned houses. Apartments rare	38% less than 15 years old	72% good
North Philadelphia (E. of Broad St.)	Densely settled. 85% single family houses	59% over 30 years old	68% good
North Philadelphia (W. of Broad St.)	Large number of two to six-family dwellings	52% over 40 years old	63% good
West Central Philadelphia	Low percentage of single family dwellings. Numerous store-and-dwelling type buildings	90% over 40 years old	50% good
East Central Philadelphia	Worst housing in Philadelphia. Smallest percentage of single-family houses	Data incomplete, but reported ages are high	18% good

Philadelphia is the largest anthracite-burning community in the country and 92.2% of the Quaker City's dwelling units are heated with coal. The next most popular fuel is oil which is used in 4.2% of the dwelling units. There are 3216 dwelling units in this city heated by central station steam. The accompanying table shows the distribution of heating apparatus and the fuels in the different sections of the city and general data regarding the character of these districts.

The Philadelphia survey was under the direction of Edward R. Feicht, consulting engineer. It included all the items covered by the Real Property Inventory which the Department of Commerce conducted in 63 cities, and in addition much other information designed to meet the needs

[1] "53.8% of Urban Residential Structures Have Central Heat," HEATING AND VENTILATING, November, 1934, page 30.

NUMBER OF STRUCTURES HEATED BY VARIOUS METHODS AND NUMBER OF DWELLING UNITS BY TYPE OF HEATING FUEL IN PHILADELPHIA AND ITS SUBDIVISIONS

(From the Philadelphia Real Property Survey, Edward R. Feicht, Project Director)

	Germantown	Manayunk, Roxborough	Logan, Fern Rock, etc.	Southwest Philadelphia	West Philadelphia	South Philadelphia	Foxchase, Tacony, etc.
Warm air	7,741	2,210	3,129	16,727	20,344	29,460	2,964
Steam or vapor	1,783	370	1,150	3,733	4,390	1,490	346
Hot water	13,624	4,702	33,415	25,827	15,897	16,732	20,247
Stove	1,159	1,551	183	1,190	1,795	6,008	445
None	80	74	9	101	111	290	7
Other	37	56	8	128	129	253	16
Unspecified	98	6	23	45	36	8	3
TOTAL	24,522	8,969	37,917	47,751	42,702	54,241	24,028
Coal	24,757	8,854	36,555	54,842	43,592	54,560	23,336
Wood	31	31	55	112	102	298	67
Gas	453	55	370	469	425	195	72
Fuel Oil	2,381	713	3,577	4,786	2,261	849	544
Kerosene	19	15	2	42	82	99	16
None	463	111	288	302	650	1,087	238
Central Plant	274	0	0	0	2,391	429	9
Other	136	9	53	130	511	181	51
Unspecified	63	9	8	84	73	55	144
TOTAL	29,027	9,797	40,908	60,767	50,087	57,753	24,477

	Somerton, etc.	North Phila. E. of Broad	North Phila. West of Broad	West Central Philadelphia	East Central Philadelphia	Total, All Districts	
Warm air	447	47,566	32,645	8,195	3,582	**174,757**	**40.4%**
Steam or vapor	42	2,679	2,246	983	412	**19,626**	**4.5**
Hot water	925	35,441	13,895	4,631	4,605	**189,986**	**43.9**
Stove	329	11,998	2,127	5,823	12,216	**44,843**	**10.2**
None	21	752	181	185	1,165	**2,984**	**0.7**
Other	2	212	65	30	72	**1,002**	**0.2**
Unspecified	2	60	7	69	213	**598**	**0.1**
TOTAL	1,768	98,708	50,986	19,916	22,265	**433,796**	**100.0%**
Coal	1,601	102,520	60,833	28,061	27,865	**468,020**	**92.2%**
Wood	60	281	80	229	149	**1,493**	**0.3**
Gas	15	735	234	263	430	**3,556**	**0.7**
Fuel Oil	50	1,993	2,500	1,263	252	**21,527**	**4.2**
Kerosene	16	160	93	45	86	**667**	**0.1**
None	15	1,269	470	261	1,279	**6,516**	**1.3**
Central Plant	0	28	33	67	0	**3,216**	**0.6**
Other	5	279	41	14	33	**1,470**	**0.4**
Unspecified	10	179	72	125	200	**1,202**	**0.2**
TOTAL	1,772	107,444	64,356	30,328	30,294	**507,667**	**100.0%**

of the City Planning Committee of Philadelphia. For those who are accustomed to studying Real Property Inventory reports attention has been called to the report that the units of the so-called "row-house" are usually individually owned in Philadelphia. In the survey, these units were considered and reported as single-family dwellings.

As stated above, owners occupy 213,957 household units in the city, and of these 63.2% are mortgaged. According to owners' estimates, 26.7% of owner-occupied units are valued at less than $3,000; 37.16% between $3,000 and $4,999; 27.04% between $5,000 and $9,999; 4.06% between $10,000 and $19,999; 1% between $20,000 and $49,999, and 0.16% at $50,000 or more. Tables for the districts show that the greatest number of units valued below $3,000 are found in South Philadelphia and eastern North Philadelphia. The percentages are, respectively, 46.85 and 45.07, as opposed to 26.7 for the city as a whole. At the other end of the value table, the greatest numbers of units valued at $30,000 or more are found in Germantown, northern West Philadelphia, and the West Central district, which have, respectively, 256, 255, and 159 in this value-group.

Code Activities Quiet as Future of NRA Remains Doubtful

THE future of NRA codes is still somewhat obscure. Late in March the legal department of NRA dropped its famous Belcher case, supposed to be the most clear cut case the Administration had against any code violator, adding to the growing opinion that the codes would soon be dropped. However, on March 26 President Roosevelt announced that the codes should continue to be strictly enforced and that there was no excuse for code violation.

In the heating industry code activities were quiet. The following material summarized here from the month's Washington happenings record only routine developments.

Administrative order 11 of the steam heating equipment industry, terminates exemption conferred in paragraph III of administrative order X-36, so that members will be required to contribute their proportionate share of the cost of administering the code, notwithstanding their principal line of business is in some other industry. This termination applies only to those who manufacture the products of the industry for sale as such.

The following interpretation has been rendered in respect to the code for the steam heating equipment industry.

Facts—It appears that certain companies which deal in the products of the industry, as defined in section 1, article II, of the code, have such products manufactured in the plants of others to their own specifications, formulas, and patents, and that said companies market such products through the conventional trade channels under their own trade names.

Question—Are said companies so engaged "manufacturers," as defined in article II, section 1, of the code, and subject to the provisions of the code?

Interpretation—Everyone who manufactures for sale under his own trade name the products of the industry, as defined in section 1, article II, of the code, whether he is engaged exclusively in the manufacture of such code products or is engaged also in some other industry; and whether so engaged as an "employer" or "on his own behalf"; and whether he actually makes code products in his own plant, or has them made for him to his own specifications, formulas, or patents; and whether he actually makes in his own plant all types and sizes of code products which he markets, or has certain types and/or sizes made for him to his own specifications, or formulas, or patents; is subject to the provisions of the code of fair competition for the steam heating equipment industry for that portion of his business which is concerned with code products as defined in the code, except as this interpretation may be in conflict with administrative order X-36 and other executive or administrative orders.

The National Industrial Recovery Board announced March 13 that the code authority for the non-ferrous and steel convector industry has applied for approval of its $2315 budget and basis of contribution for the calendar year 1935.

The basis of contribution is 1/5 of 1% of the dollar volume of business of each member of the industry.

Announcement was made March 11 of a postponement of the effective date of the insulation survey bureau for the states of New York and New Jersey, including Greater New York, from March 6 to April 6, 1935, on application of the code authority for the insulation division of the construction industry.

On February 14 the Board had approved the establishment of such a survey bureau to estimate the amount of materials to be used on industrial insulation jobs. It was effective 20 days after date of approval. The bureau would cover Greater New York, Long Island, the counties of Westchester, Rockland, Orange, Putnam, and Sullivan, and parts of Dutchess and Ulster counties.

NRA on February 26 announced regulations governing the submission of code administration budgets and requiring all budgets for the current fiscal period not yet submitted to be filed with the board before March 31. The regulations apply to all code authorities and forbid any expenditure after March 31 by a code authority not in accordance with approved budgets.

Statistical Program Progresses

Returns from the statistical questionnaires on employment conditions which have been mailed, under the direction of the construction code authority, to more than 100,000 contractors, are providing valuable data of particular use in the planning and execution of the work relief program, the statistical department of the code authority reports.

However, less than a tenth of the number of questionnaires which were mailed have been received so far with additional ones coming in at the rate of only a few hundred a day. It is of utmost importance to every member of the construction industry that the questionnaire be filled in and sent to the code authority in the franked envelope which is provided. The members of the industry should be made to realize the powerful advantage that accurate statistics on construction can be in the final decision of who gets the money to be appropriated by congress in the work relief bill. It must be a matter of personal concern to each contractor to see that not only is his report forwarded immediately but that his competitor or sub-contractor or neighbor also sends in these highly important data on employment and the amount of construction.

To be of maximum use, every one of the forms which

(Concluded on page 73)

ABSTRACTS of Current Papers, Books and Pamphlets

Air Conditioning Service Manual

There has been a noticeable lack of information on the servicing of air conditioning apparatus in the books on air conditioning. This is probably due to the fact that most air conditioning manufacturers arrange to service their own installations. It is the purpose of the author of this manual to make this information available to all service and operating men.

Because it is written for the service man, just enough theory is included to explain the installation and operation of air conditioning apparatus This section is well written and explains the basic theory and laws in such a manner as to make them easily understood by anyone with a slight knowledge of engineering principles.

In discussing the actual apparatus used in air conditioning installations the author makes use of a considerable amount of manufacturers' literature. A large number of illustrations are employed in this section.

Although the largest amount of space is used in discussing the theory, operation, and servicing of refrigerating apparatus, there is much on the other apparatus used for air conditioning. There are chapters on control devices, insulating materials, operating of air conditioning systems, air filtration, and estimating requirements for stores, restaurants, and homes.

[*"Official Air Conditioning Service Manual," by L. K. Wright. Published by Gernsback Publications, Inc., 99 Hudson St., New York: flexible binding: 8½ in. x 11 in.; 347 pages; price,* $5.]

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Controls for Domestic Gas Conversion Burners

Gas conversion burners for domestic heating plants may be controlled by any one of a number of different methods, either hand or automatic. Some of the control devices regulate both the flow of gas and air while others control only the gas. It is natural to expect that the operating economy should be affected by the control or non-control of the air supply and by the methods of controlling the fire.

The object of the experiments reported in this paper was to determine which of the possible control methods is the most economical, how much saving can be effected by the most economical method over the others, and what is the most practical method for burners of domestic size. It was also desired to determine the effect, if any, of sensitivity of control on the fuel economy.

Six possible control methods were investigated. (1) Intermittent control of both gas and air; gas flow rate set for a fuel fire. This is the usual method of automatic control with burners of the domestic size. (2) Intermittent control of gas only, the gas flow rate being set for a full fire, and the air damper remaining fully open. This also is a frequent method of automatic control. (3) Throttling of gas only while the air damper remains fully open. This is the usual method of hand control. (4) Throttling of both gas and air, the air supply being adjusted for best conditions at all times by means of a damper at the intake. This method is often used for the automatic control of large installations, but proved impractical in domestic sizes. (5) Intermittent control of both gas and air; gas flow rate set for a half fire, the air being adjusted accordingly by means of an intake damper. (6) Intermittent control of gas only; gas flow rate set for a half fire, and the air damper remaining open at the point which is optimum for the half fire.

Based on the average heating season in Fayetteville, Ark., examination of the test results leads to the following conclusions: When the air damper opens and closes simultaneously with the gas valve, the ordinary intermittent control, Type (1), is as economical as any other type tested. Throttling of both gas and air, Type (4), gave good economy, equalling Type (1), but proved impractical for burners of domestic sizes, as the air adjustment is extremely delicate at light loads. The combined throttling and intermittent control is no more economical than the ordinary intermittent Type (1) except where the heating plant is undersized and requires hard driving in severe weather.

A waste of about 9% of the fuel burned, compared with Type (1), occurs when the air damper is allowed to remain fully open at all times. This is true for both the intermittent and throttling controls.

Varying the sensitivity of the automatic control showed no effect on operating economy.

[*"Control Methods for Domestic Conversion Gas Burners," by L. C. Price, Bulletin No.* 12, *Engineering Experiment Station, Fayetteville, Ark. Paper cover;* 19 *pages; price* 10c.]

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1935 A.S.H.V.E. Guide

Engineers, architects, contractors, students, and men engaged in trades covering heating and air conditioning have learned to rely on data found in The Guide, published annually by the American Society of Heating and Ventilating Engineers. The 13th edition of this reference book and text has just been released, and copies are now available.

Though the Guide publication committee has produced a new book, it has retained from the older ones those data which are basic and fundamental and it has made additions and changes to cover new developments in both theory and practice. More than 200 engineering specialists have helped in the preparation of The Guide 1935.

The Guide 1935 has three divisions. The technical data section is a reference book and text, which in its 41 chapters covers the fields of heating, air conditioning, cooling, insulation, and ventilation in their theoretical and practical aspects. Starting with factors fundamental to heating and air conditioning—air properties, air distribution, ventilation requirements, heat transmission coefficients of materials and of various structures—it carries on through discussions of the many types of heating, cooling, and conditioning needed, with their applications and methods of accomplishment. It also treats of systems of heating, cooling, and air conditioning, of fuels, of apparatus and machinery, of test methods and instruments.

A chapter on sound control considers the theory and practice of insulating against sound. The concluding chapter gives abbreviations, values, symbols, and conversion equations for the terms used in this text and related ones.

Wholly new this year is the section called Problems in Practice which supplements chapters 1—40. This is in the form of questions and answers relating to the material presented. These practical treatments summarize each chapter in an interesting and instructive way, and it is felt that this added feature will prove of great value to users of The Guide. A more comprehensive index to the technical data section has been made in order that references may be more quickly checked in the text.

The catalog data section occupies 224 pages. An index to modern equipment follows this.

Included in The Guide is a roll of membership of the A.S.H.V.E., made both alphabetically and geographically, with a summary of the committees and officers of the society.

[*"A.S.H.V.E. Guide, 1935," published by the American Society of Heating and Ventilating Engineers, 51 Madison Ave., New York. Flexible binding; 1024 pages; 6 in. x 9 in.; price,* $5.]

Ions, Their Nature and Possible Physiological Effects

Carriers of electricity in gases, notably in mixtures such as atmospheric air, can be divided into three groups. These are large ions, normal ions, and free electrons. Early investigations of the large ions have shown that they consist of material particles, dust, or liquid droplets. Such particles, if solid, are usually covered with a condensed film of water vapor whose presence and thickness depend on the degree of saturation of the air and the nature of the particle. The number present varies with the condition of the atmosphere and on the ionic content of the air or else on the origin of the particles.

In ordinary air, unless the humidity is low and turbulence is very great, the large ions are few in number. Doubtless some of the particles occasionally pick up charges from a very few ions normally present and become charged. The majority are uncharged.

Whether the presence of charges on solid or liquid particles in the atmosphere exerts any physiological action is not known but seems highly questionable. Those particles are inhaled with the air and either reach the mucosa of the respiratory tract or enter the lung cavities. If ions of only one sign reached the lungs, they would pass a current through the tissue walls on their course through the body to the ground. Such galvanic currents in cells, if of sufficient magnitude, could produce physiological effects through electrolysis. These static currents are, however, of such magnitude that even were the ions all of one sign (a condition rarely realized) the effect could never be noticed, since the amount of solid or liquid matter required to introduce charges of any magnitude must of themselves produce pronounced and masking physiological effects. One is led to conclude that the physiological effects produced by the inhalation of large ions must be immeasurably small compared to the effects produced by the accompanying solid or liquid carriers on the respiratory tissues.

Normal ions are produced in air as a result of the action of various radiations incident on air molecules or solid particles in contact with the air. These radiations consist of cosmic rays and their secondaries (always present but very few in number), gamma rays from radioactive bodies, X-rays, and ultra-violet light. Gamma radiation is always present in some amount from the radioactive constituents present in the earth and air, but is relatively weak over the ocean. X-rays normally are not present in any quantity except in laboratories. Ultra-violet light is present in sunlight but the wave lengths are too long to ionize the air appreciably at the surface of the earth. Thus aside from air in the neighborhood of artificial ionizing agents, the normal atmosphere is but little ionized.

When considering the physiological effect of normal ions, one must take into account two possibilities: the effect of the charge on the mucosa and the tissues, and the effect of the foreign molecules brought into the body with the complex ions. As has been indicated in the case of the large ions the effect of the charge cannot be significant.

In discussing the companions of the ions, one faces another question. Could one control the age of the ions breathed and the superchemical purity of the air, one might get a selective group of molecules into the respiratory tract. The amounts would, however, be exceedingly small compared to the quantities of the same products which could be inhaled by introducing one part per million of the chosen molecules into the air that is inhaled. Hence, the value of gas ions and their effect would be ridiculously minute. Experiments in this direction are hardly needed as simple calculation reduces the question to one of absurdity.

On the other hand, an attempt to study this question experimentally on human subjects ceases to be one of absurdity. It is exceedingly dangerous to health. In an attempt to create a few million ions per cubic centimeter and to maintain the concentration for inhalation experiments, the air in a very few minutes is charged with concentrations of violently reactive gases. That such must be the case is seen when one realizes that ionization is a very inefficient process. About half the energy put into ionization is spent in activating the air. The energy of activation for most chemical processes is a small fraction of the ionizing energy. Finally, even the more unstable chemical products are thousands to millions of times more stable than the ions.

Concerning the danger of these products to human health when taken into the lungs, little need be said. Ozone was at one time heralded as a vitalizing and health-giving product, a cure-all for disease, and a wonderful disinfectant. The medical profession has long ago abandoned ozone as a particularly irritating and dangerous compound.

As regards free electronic carriers, little need be said of their possible physiological action in air. They do not exist as electrons for a sufficient time to be considered as a feature at all. Thus the effects which they might cause must all be included under the heading of ions which has already been discussed.

It is obvious from the foregoing that the possible physiological effects of gaseous ions as they influence the problems of air conditioning are absolutely negligible, and any attempts to investigate experimentally the effects on human beings must not only be regarded most critically but also must be regarded as dangerous. In view of the great predominance of foreign matter in air compared to the indefinitely minute ion concentrations, the air conditioning experts would do far better to study and understand the effects of small amounts of dust, ozone, N_2O_5, SO_2, NH_3, CO_2, CO, and water vapor in the air on the comfort and well being of the inhalants, than to waste any time considering gas ions.

[*"The Nature of Ions in Air and Their Possible Physiological Effects," by Leonard B. Loeb. Paper presented at the 41st annual meeting, A.S.H.V.E., Buffalo, N. Y., January, 1935; approximately 3,000 words; bibliography.*]

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Carbon Monoxide Alarm

Carbon monoxide poisoning is recognized as one of the four major industrial hazards. It is caused by the improper elimination of carbon monoxide, one of the products of combustion. Because carbon monoxide is an odorless and colorless gas it is impossible to detect its presence without resorting to the use of instruments. A great need has existed for a satisfactory and reliable instrument at a reasonable cost to either indicate the carbon monoxide concentration in the space to be ventilated or to be used for automatically controlling the air supply in order to hold the carbon monoxide concentration below the limits of safety.

To fulfill this need an instrument has been developed for indicating the percentage of carbon monoxide and for sounding a warning when the concentration reaches a dangerous point. The instrument is an adaption of the Bureau of Mines carbon monoxide recorder but is less sensitive and expensive than this instrument.

The principle of measuring the carbon monoxide is based upon the rise in temperature of air when the carbon monoxide in air is oxidized into carbon dioxide. This rise in temperature is measured by means of a thermocouple and the percentage of CO indicated directly on a small millivolt meter.

In the actual instrument the air is drawn through a filter by a small fan. The air stream is forced through an electric heater and is then divided into two streams, one passing through a granular material activated with the oxidizing catalytic agent and the other through an inactive granular material of the same resistance to the flow of the air and of the same heat capacity. A compound thermocouple with an alternate junction in each air stream sets up an electric current, the voltage of which depends upon the temperature difference between the two streams. This temperature differential is caused by the heat liberated when the CO in the one stream is oxidized. The per cent

of CO is read directly on a small millivolt meter. The pointer of the meter closes a relay when the concentration reaches any predetermined value at which the alarm is set.

Tests conducted on the instrument showed that it was accurate to within at least ½ part of CO in 10,000 parts of air. Since this was accurate enough for the purpose, no more sensitive tests were made. It was also determined that the instrument does not have sufficient sensitivity to operate with sufficient reliability at concentrations lower than 2 parts of CO in 10,000 parts of air.

In actual operation it was found necessary to recharge the catalytic agent about every two weeks and to occasionally change the air filter. Aside from these attentions, the instrument should operate satisfactorily over an indefinite period.

[*"A Carbon Monoxide Alarm and Ventilation Control," by F. C. Houghten and Linwood Thiessen. Paper presented at the 41st annual meeting of the A.S.H.V.E., Buffalo, N. Y., January, 1935; approximately 1700 words; illustrations.*]

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Tests of Heating Systems in an Industrial Building

The manner in which heat is distributed in a heated space is known to have considerable influence on the cost of heating. Maintenance of a uniform temperature in the occupied zone and a minimum temperature above that zone is conducive to efficient heating. These tests were undertaken to determine the effectiveness of heating with three different types of systems. They were conducted in a 71 ft. x 182 ft. one-story, saw-toothed structure. The side walls are of brick and one end wall is of brick and stone. It is considered to represent the usual industrial building.

The laboratory building as originally built was heated by a two-pipe vacuum system using direct radiators. This consisted of radiators placed along the walls and in the trusses directly below the skylights. Total radiator surface was 4,431 sq. ft. Fifty-three per cent was located directly below the skylights.

In the second test, seven suspended unit heaters were installed 10 ft. above the floor. The total capacity as determined from the catalogs was 4,676 sq. ft. with 218° steam and 60° entering air. The heaters were selected to have approximately equal capacities

Each of these seven units was tested for steam and air capacity in a test apparatus. These rating tests were conducted during the year 1932-33 and were made in accordance with the Standard Code for Testing and Rating Steam Unit Heaters. Total heat capacity was found to be 1,036,700 B.t.u. or 4,318 sq. ft. equivalent direct radiator surface with 218° steam and 60° air. Total air moving capacity was 17,027 c.f.m. Manufacturer's rating was 1,121,905 B t.u. and 20,265 c.f.m.

Two floor unit heaters of identical size and construction were installed as a third heating system. Total manufacturer's rating was 910,000 B.t.u. or 3,790 sq. ft. E D.R. at 218° steam and 60° entering air.

The same mains and branches were filled with steam in each of the tests of the three heating systems. The piping was in excess for the unit heater systems, since the branches to the various radiators were included. Branches added to the original system for the unit heaters were comparatively short.

A thermostatic control system, electrically operated, was installed to control the temperatures during all tests. Double or two temperature thermostats were installed on three posts at the center line of the building so as to divide the space into three equal zones. A system of switches was installed so that the control could be shifted easily from one heating system to another. An electric clock unit shifted the circuits between the night and day thermostats when operating on dual or two temperature control.

The thermostats opened and closed steam valves on the direct radiators, started and stopped the fan motors in the case of the suspended unit heaters only or in conjunction with the opening and closing of the steam valves, and for the floor units shifted the position of the bypass damper. Fan motors on these floor units ran continuously. Since there were only two floor units placed at opposite ends of the laboratory, only the two end thermostats were used. On certain of the tests of these floor units, thermostats were placed directly in front of the units and in the path of the return air.

The following conclusions may be drawn as applying to the three heating systems and the conditions under which the tests were conducted:

1. For dual control with day thermostat set at 70° for 11 hr. and the night at 50° for 13 hr., the saving of steam over continuous control with the thermostat set at 70° for 24 hr. was: (a) For direct radiation 15% and probably a much larger saving had sun intensities and wind velocities been equal; (b) For suspended unit heaters with fan and steam control 30%; (c) For suspended unit heaters with fan control and continuous steam 25%.

2. For dual control with the day thermostat set at 70° for 11 hr. and the night at 60° for 13 hr., the saving of steam over continuous control with the thermostat set at 70° for 24 hr. was: (a) For suspended unit heaters with fan and steam control 24%; (b) For floor unit heaters, with mixing damper control, continuous steam and continuously running motors 16%.

3 The saving of suspended unit heaters over direct radiation both operating on continuous control was something over 13.5%, and might have been 20% had sun and wind effects been equal.

4. The saving of suspended unit heaters over direct radiation both operating on dual control (70-50°) amounted to 25%.

5. The saving of floor unit heaters over direct radiation both operating on continuous control was 9% and would have been higher had sun and wind effects been equal.

6. The saving of steam of floor unit heaters over suspended unit heaters both operating on continuous control was 2.3%.

7. The saving of steam of suspended unit heaters over floor unit heaters both operating on dual control (70-60°) amounted to 7%.

8. The average temperature gradient for all days of tests for the three heating systems over the entire period of test resulted in a change of 2/3 of 1% per ft. of height above the 5-ft. level.

[*"Tests of Three Heating Systems in an Industrial Type of Building," by G. L. Larson, D. W. Nelson, and John James. Paper presented at the 41st annual meeting of the A.S.H.V.E., Buffalo, N. Y., January, 1935; approximately 4500 words; illustrations; graphs.*]

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Design of Solar Heaters

This paper is intended to give an analysis of the factors entering into the use of the sun heat for warming domestic hot water. The author states in the opening paragraphs that up to the present time, the design of solar heaters seems to have been one of hit-and-miss, modified by the original ideas of the designer, who may have copied one he has seen, or else gone ahead blindly to the best of his ability. The results of such conditions are just what might be expected; some of the solar heaters give good service and others do not. In recent years the advance in the art of heating due to research on heat transfer and sun effect problems makes it possible to apply some of the data which have been developed to the design of solar heaters.

A number of conclusions may be drawn from this study of the problems involved in the design of solar heaters. The first is that solar heaters, especially when combined with an auxiliary heater, have a much wider use than has been developed to date. Second, that they can be made to furnish a considerable supply of heated water at all times of the year in climates where the outside temperature does not go below freezing. Third, that the tank storage

should approximate 62% of the daily use in order to include a 25% retention. Fourth, that the box containing the coil should be inclined toward the sun so that the bottom will be at right angles to the sun rays at its lowest southern position on December 21. Fifth, that there is no advantage in placing the coil pipes closer together than three diameters center to center as the sun effect on the coil will not be increased and the size of the box cannot be reduced without the loss of some of the sun heat. Sixth, that the coil surface in square feet shou'd be not less than 50% of the number of gallons of water to be heated per day. Seventh, that double glass is desirable and beneficial in all cases where the minimum outside temperature goes below 60. Eighth, that the diameter of the coil piping and circulation lines should be not less than 1 in.

[*"Sun Effect and the Design of Solar Heaters," by Harold L. Alt. Paper presented at the 41st annual meeting of the A.S.H.V.E., Buffalo, N. Y., January, 1935; approximately 6000 words; illustrations; tables.*]

Pocket Size Air Conditioning Manual

An unusual though extremely practical little manual on heating and air conditioning has been prepared by Louis Harding. The data have been largely abstracted from his books on heating and ventilating and from the A.S.H.V.E. Guide.

Many engineers will want to carry this book with them at all times because of the great amount of information in it and the convenient size. The pages are crowded with compact tables, charts, and formulas and contain only a small amount of descriptive material. Practically all of the information usually needed by the heating engineer will be found between the covers of this little book.

[*"Heating and Air Conditioning Manual," by Louis A. Harding. Published by the author at Buffalo, N. Y.; flexible binding; 3 in. x 5½ in.; 268 pages; price,* $1.50.]

A Non-Technical Explanation of Air Conditioning

In writing this book, the author has tried to keep in mind the non-technical reader who is attempting to learn something of the fundamentals of air conditioning. It appears that he has been successful in this aim for the book does manage to clarify many of the technical terms and explanations which often cause the uninitiated much trouble.

There are 28 chapters in the main section of the book. While many of them are short they do manage to give most of the essential information necessary to the beginner and the mechanic who is interested in small installations. A large number of pictures of the air conditioning equipment that is on the market are used to illustrate the text.

An unusual feature of the book is the section devoted to ozone. Special chapters are used to discuss the application of ozone to ventilation and air conditioning and the purification of drinking water.

[*"Air Conditioning and Ozone Facts," by E. W. Riesbeck. Published by The Goodheart-Willcox Co., Inc., 2009 South Michigan Ave., Chicago; flexible binding; 352 pages; 5½ in. x 8 in.; price $3.50.*]

Marketing Industrial Equipment

"The business depression through which this country has been passing has disclosed how well we can design and manufacture productive machinery and how well we can use this machinery to produce goods in quantity at low cost, but we have not learned how to distribute this machinery in an economical manner." In this way Bernard Lester, assistant industrial sales manager of Westinghouse, introduces his new book, "Marketing Industrial Equipment." This problem is still unsolved, largely because the engineering mind, absorbed in the technical details of the machine itself, is frequently not adapted to solving problems of a commercial character. At any rate, the distribution of durable or capital goods deserves at least as much careful thought as has been bestowed upon the distribution of merchandised, or consumer, goods.

The machinery and equipment manufacturer is faced with entirely new problems in developing today's market. Most users of equipment do not recognize they are in the market for such machinery It requires a careful analysis of plant processes and plant equipment to determine what must be done to increase overall profit or decrease losses. This effort must be entirely based upon the point of view of profit to the user. The old arguments pertaining to the equipment itself present no appeal, unless the use of the machine as a part of a manufacturing process will yield a return justifying the expenditure. In his book Mr. Lester presents in a practical way how the salesman can meet these present day problems in selling. Many of the cases he uses as examples are from the heating and air conditioning industry.

Chapters include those on character and extent of markets, equipment required by industry, product and distribution analysis, equipment distribution, sales expense and organization, sales promotion and customer analysis.

[*"Marketing Industrial Equipment," by Bernard Lester. Published by McGraw-Hill Book Co., New York; cloth bound; 307 pages; 6 x 9 in.; price,* $3.50.]

BRIEF REVIEWS

DUST. This is the first published book on dust. It deals in detail with the wind movement of dust and includes much information of the meteorological control of the staubosphere. This is a thorough and able treatment of a considerably neglected but exceedingly important subject. [*"Dust," by S. Cyril Blacktin. Published by The Sherwood Press, Cleveland, Ohio; cloth-bound; 6 × 9 in.; 296 pages; price,* $6 50.]

STEAM JET REFRIGERATION. Part 5 of the series of lessons on air conditioning for heating contractors, prepared by the Heating, Piping and Air Conditioning Contractors National Association, deals with the subject of steam jet refrigeration. There are three lessons in this part and they contain information and data on the theory, selection, design, and applications of the equipment.

[*"Air Conditioning for Heating Contractors—Part 5—Steam Jet Refrigeration Equipment." Published by the Heating, Piping and Air Conditioning Contractors National Association, 1250 Sixth Ave., New York; paper-cover; 4¼ in. x 7¼ in.; 29 pages; price* 50c.]

VENTILATING COWLS. This is the report of an investigation of ventilator heads (cowls) which was carried out at the Research Laboratory for Building Structures at the Royal College of Science, Copenhagen, Denmark. Purpose was to determine operating characteristics of ventilating cowls under various wind conditions. Contains an excellent mathematical analysis of the operation of ventilators and a thorough discussion of the results of the experiments. [*"Experiments with Ventilating Cowls," by Chr. Noekkentved. Agricultural Engineering, January,* 1935; *approximately* 4000 *words; 6 pages; illustrations.*]

WEATHER. In the new edition of this classic work prominence is given to the application of physical principles in explaining the processes of weather. A good deal of modern theory, based on the vast accumulation of observational material, has also been introduced. [*"Weather," by Ralph Abercromby. New edition revised and rewritten by A. H. R. Goldie; published by The Sherwood Press, Cleveland, Ohio; cloth-bound; 6 × 9 in.; 274 pages; price,* $4.]

EDITORIALS

Amortized Mortgages

As new construction is now beginning to show itself again there is renewed interest in the form which the financing is taking. It looks as if the amortized mortgage is really coming into its own. In the last period of activity all too much of the financing was through lump sum, short term mortgages which contained no definite provision for steady retirement of principle. Now there seems to be a newly realized emphasis on the advantages of the amortized method of finance. In the plans of FHA this method looms large. It is quite possible that much of the present emphasis can be traced back to the government efforts. If so, this feature alone should compensate for all the cost of the government move for there seems little doubt that unless this method of repayment is included in the plans for financing new buildings we will simply be inviting a repetition of what happened before. Most of us have little to do with financing plans and can exert but little direct influence over them but we all have a most important stake in them nevertheless. We owe it to ourselves to lend whatever assistance we can in seeing that all new building is financed on a sound plan.

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Cost-Cutting or Stimulation of Demand—Which?

Repeatedly of late we have come across the printed statement that what is holding back the renewal of activity in building construction is the high cost of labor and materials. The implication is that material prices should be reduced and that wage rates should be cut. Once this is done, so goes the argument, the building industry will spring into a wonderful revival.

It is hard to understand how such ideas gain enough credence to even find their way into print. Certainly it takes no profound or extended thought to reach the conclusion that this argument is at least questionable if not downright fallacious.

Consider first of all that labor and material costs are only part of the costs of new building construction. Moreover, operating costs including carrying charges are or ought to be brought into the discussion. What logic makes it possible to conclude that merely by reducing a part of the cost, sufficient reduction in the total is to be obtained to overcome all other factors and start building construction? A reduced cost of labor and materials can be expected to bring about some increased volume of construction—in the same way that a reduction of any other cost would do so—but what evidence is there to show that great enough reductions could possibly be secured to produce a really substantial revival? If there are convincing answers to either of these questions the facts have not come to our attention.

In fact it is even doubtful if the right road to revival lies through cost-cutting at all. From a multitude of experiences of other industries there is a strong basis for arguing that the proper procedure is to look for a solution by stimulation of demand. It seems almost self evident that when the demand for new construction becomes strong enough, new construction will start in the same way that it always has. Demand stimulation includes such diverse factors as generally increased incomes, improved methods of financing, removal of the menace of old buildings in weak hands, faith in the future, and last but by no means least the creation of building types, designs, and equipment which will be definitely superior in usefulness, financial return, and in satisfaction of ownership to anything which we now have. If we can reach or even approach such a state of affairs there will be a revival of new construction.

Certain it is that there is a good realization in many quarters of the necessity of these things, and also some evidence that the conviction is gaining ground. Certain it is also that not only is the problem being attacked from this point but that progress is being made.

Let us have more emphasis on the side of demand stimulation and less on the side of trying to force down labor and material costs.

●

Controlling Noise

Few of us have had occasion to follow any too closely the interesting work which has been done in the past three or four years on the problems which arise because of sound or noise in heating and ventilating installations. Formerly noise just had to be tolerated as it came. There was little that could be done about it. The real impetus to find a solution came when radio broadcasting studios, sound picture stages, and theaters were air conditioned. In them control of noise originating in or transmitted through ducts and machinery was essential. As is usually the case, the demand for control brought about a really intensive study, and the development of materials, methods, and instruments to do the job. This movement has now reached the point where there should soon be generally available enough actual numerical data on the sound chracteristics of equipment and materials so that common problems can be solved with good assurance of success.

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More HOLC Money

Prospects are that more money is to be made available to Home Owners Loan Corporation. Charges that there is too much politics in the affairs of the corporation and that it is being loaded with poor properties are probably true to some extent. To what extent no one seems to know. There seems little doubt though that its past work in extending loans was necessary if the residential real estate situation was to be remedied. Evidently there are still more distress properties to be put into position where they will not be a menace. New construction cannot go ahead until the menace of property held in weak hands is out of the way. Given even reasonably good management and reasonable freedom from politics, extension of credit is worth its cost if it succeeds in clearing a way for the construction industry to move ahead.

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New Emphasis on Modernizing

There is much background activity going on in connection with new programs and objectives for FHA in the modernizing phase of its work. Pending in Congress is the amendment to the act which will permit insurance on modernizing loans up to $25,000 instead of up to $2,000. Also the placing of emphasis is being studied to learn if it should be shifted from residences to other kinds of buildings. There is no doubt that there is a huge amount of work to be done in buildings other than residences. The big job still is to find ways of actually getting it done. FHA is in a position to lend powerful help. We still believe in the objectives of FHA and still urge that all its efforts on modernizing deserve your wholehearted support no matter where the emphasis may happen to fall from time to time.

NEWS OF THE MONTH

Air Pollution and Methods of Cleaning Air Described at Air Conditioning Bureau Meeting

BOSTON—About a hundred members and guests assembled March 20 for the regular monthly meeting of the Air Conditioning Bureau of Boston. It was one of the most interesting meetings from an engineering standpoint that has been held for some time. There were four guest speakers, and present also in the audience were Prof. James Holt of the Massachusetts Institute of Technology, and Prof. James A. Moyer, director of University Extension, Massachusetts Department of Education, who acknowledged introductions to the assemblage.

Theodore Hatch, instructor at the Harvard Engineering School and Harvard School of Public Health, was the first speaker, on "Atmospheric Pollution." The general subject of the meeting was "It's In The Air." Mr. Hatch defined polluted air as that containing anything not in the list of elements that form pure or normal air, such as oxygen, nitrogen, carbon dioxide, and rare gases, with a variable quantity of water vapor. "Actually, however," he said, "even clean country air contains small quantities of organic and inorganic matter which must be accepted as normal constituents."

He then cited sources of pollution from natural causes, such as the recent dust storms that swept over the country from the midwest plains and the dust from the volcano Krakatoa that blew up some years ago and threw vast quantities of dust into the upper atmosphere that was held suspended for two years and carried around the world six or seven times. He also mentioned the case in Belgium some years ago, of a toxic condition of the atmosphere from smelter gases, which, under unusual meteorological conditions, concentrated in a valley and killed many people.

"Generally speaking, it is the domestic and industrial sources of pollution that are of greatest importance. There is irony in the fact that without human industry and without congested centers of population there would be no smoke problem. Industrial sources of pollution such as the dusty trades and processes involving the production of toxic gases and fumes may contribute to general atmospheric pollution, but the development of dangerous concentrations within the factory is of much greater importance.

"The hygienic importance of atmospheric pollution is not great. In intangible ways it probably lowers the general health level, but no clear-cut statistical evidence of serious injury to community health has been demonstrated. But damage to goods in factories, painting, and laundry bills, repairs to damaged buildings, etc., are directly chargeable to atmospheric pollution in many cases. Solution of the problem requires combination of several lines of attack: eliminate sources of pollution by substituting smokeless fuels and by providing proper combustion of fuels; locating industries and residential areas in proper relation to each other, and with regard to local topography and meteorology (prevailing winds for example); cleaning the air at the source —at power houses, and so on."

Mr. Hatch cited some notable examples of damage caused by air pollution, such as the prevalence of silicosis in the highlands of South Africa, due to a high percentage of silica in the soil; the uncovering of two remarkable and valuable paintings in Westminster Abbey, after two years work cleaning the ceiling of a chapel, and the damage to the state capitol at Knoxville, Tenn., through the action of the sulphur dioxide in the air, which precipitated sulphurous acid that acted directly on the exterior stone, causing it to flake, and the killing of the plants in the first St. Louis Botanical Garden through sulphur dioxide emitted from continuous use of soft coal.

Speaking of air conditioning in the home he said: "One important factor in the design and operation of the air cleaning plant in the home is the fact that activity within the house itself constitutes an important source of pollution. It is not enough simply to insure the entrance of clean air; internal sources of dust must also be controlled."

J. R. McConnell, of the American Air Filter Co., Louisville, followed with "Air Cleaning—The First Step in Air Conditioning." He declared there was too much "ballyhoo" and not enough common sense in air conditioning at present.

"To fully appreciate the vital need for cleaning air and to understand the function of air cleaning equipment in the modern air conditioning system, it is essential to know something about the physical characteristics of air-borne impurities called dust. All air contains dust. Even in sections remote from civilization and at the highest altitude man has been able to reach atmospheric dust is found in appreciable quantities. The size, variety, and volume of these dust particles is almost beyond the conception of the human mind.

"They vary in size from the cinder that gets in one's eye to motes so small that several million are required to cover the head of a common pin. For convenience they are measured in microns—a unit of microscopic measure roughly 1/25,000 in.

"All dust is objectionable, but soot is particularly harmful, not only from the standpoint of cleanliness within a building, but for its detrimental effect upon the equipment. It was the necessity for eliminating soot and other carbon that brought about the present practice of cleaning air by the filtration method.

"There are three basic forms—the plane and round surfaces, and the streamline shape for air filter baffles. All media are some variation from these. Their relative resistance would seem to indicate that the streamline form is the ideal shape for this service —which is true as far as resistance is concerned. But other factors limit its use in air filtration.

"The three basic characteristics of an air cleaner are: 1 efficiency in dust removal; 2 resistance to air flow; 3 dust holding capacity. Comparing the performance characteristics of a surface filter with a viscous filter, both having the same rated capacity, we see that all filters are by no means equal. Automatic filters offer the advantage of a constant unvarying air supply with a minimum of attention.

(Concluded on page 66)

Central Heating Plants in the U. S. S. R.

Moscow—Central heating by thermo-electric plants was introduced into the Soviet Union only a decade ago, and in the country today there are 60 thermo-electric centrals with a total power of 700,000 kw. Plans call for the increase of this power to 2 million kw. in 1937 when the second five-year plan ends.

Ten years ago, 300 meters of pipe supplying a bathhouse and a few other buildings with heat from a central station in Leningrad was the first central heating plant in the Soviet Union. In the new city of Berezniki in the northeastern part of the country there is a thermo-electric central today with a capacity of 88,000 kw., constituting the largest central heating plant in the world. In length of heating pipes, Leningrad today holds second and Moscow third place in the world.

In 1931, the government began the construction of 20 powerful central heating plants in the large industrial centers, such as Moscow, Leningrad, Kharkov, Chelyabinsk, and Stalingrad. (Those produced in the first six years since their introduction were comparatively small).

Spokane A. C. Bureau Continues Lectures

SPOKANE—Providing for greater exploitation of air conditioning, the Spokane Bureau of Air Conditioning continued its series of educational talks through March for the benefit of the public. The lectures are for homeowners as well as those professionally interested in air conditioning.

Among the lecturers are R. C. Chase, of the American Air Filter Corporation of Tacoma, who spoke on "Cleaning and Washing Air"; Prof. H. F. Gauss, of the University of Idaho, on "Air Motion Fans, Dust Systems, and Noise Elimination"; while cooling and dehumidification in air conditioning were discussed by M. C. Terry, of the Kelvinator Corporation. Several additional lectures are being held to round out the complimentary course to all Spokane people interested in air conditioning.

Iowa Hotel to be Conditioned

DAYTON—Frigidaire Division announced February 16 receipt of an order from F. L. Maytag, washing machine manufacturer, for the air conditioning of the Maytag Hotel in Newton, Ia., personally owned by Mr. Maytag. The building is five stories high and a block long. It will be one of the most completely air conditioned hotels in the United States, having a majority of its guest rooms and suites as well as most of its public rooms conditioned.

The contract calls for completion of the installation work by May 1, in readiness for summer business.

Western Michigan Group Meets

EAST LANSING, MICH.—L. P. Breckenridge, emeritus professor of mechanical engineering, Yale University, stressed briefly the progress which has been made during the last half century, in a talk before the Western Michigan chapter, A.S.H.V.E., February 11. He introduced Dean Dirks of Michigan State College who discussed the paper "Summer Cooling" presented at the annual meeting by Prof. Alonzo P. Kratz. Prof. L. G. Miller discussed and described the thermal-integrator and also the katathermometer.

At this chapter's previous meeting, January 14, N. S. Yost, chief engineer of the Howell Electric Motors Co., Howell, Mich., outlined the various types of alternating current motors and their control and described their characteristics and applications. Of particular interest was his classification of motors in regard to quietness and factors contributing to noise in motors.

Sound, Noise Prevention, and Dehumidifying Subjects of New York A. S. H. V. E. Meeting

NEW YORK—A two-reel sound movie film on the general subject of sound and noise prevention, with an accompanying lecture by J. S. Parkinson, head of the acoustical development section of Johns-Manville Corporation, and a paper by Eugene Milener of the American Gas Association on "Summer and Winter Air Conditioning with Gas," were the features of the regular meeting of the New York chapter of the A.S.H.V.E., March 18.

The movie film showed graphically the difference between sounds of high frequency and those of low frequency and the difference in amplitude of sounds. It showed a number of acoustical phenomena such as refraction, reverberation, echoes, etc., and in short, covered in a non-technical way the fundamentals of sound. In his lecture Mr. Parkinson showed how noise is measured and used as an example a noise manufacturing machine from which noise issued through a tube in which the speaker inserted a felt-lined tube to show how the sound was absorbed by this material.

According to Mr. Parkinson a committee of the society is now working on the problem of noise in an attempt to classify all types of heating and ventilating equipment according to the type of sound it emits and the loudness of such sound, and in addition to set up maximum standards for the amount of noise permissible in a particular type of room. Knowing these two things—the amount of noise a given machine will produce and the amount of noise that is permissible at the end condition, the engineer will know at once how much noise prevention he must provide.

Mr. Milener briefly reviewed the accomplishments of the gas industry in automatic heating and described the work which the Industrial Gas Section of the American Gas Association has done in developing a summer conditioning unit which will adsorb moisture for dehumidifying. In the speaker's opinion, more installations of summer air conditioning can be satisfactorily supplied by dehumidifying the air than by mechanical cooling with dehumidifying as a by-product. Dehumidifying should be the principal objective, according to Mr. Milener.

The speaker then described a unit now commercially available for accomplishing dehumidifying, using gas. Silica gel is the adsorbent used in this machine.

R. H. Carpenter, the chapter's council member, discussed the method of electing the nominating committee. President H. W. Fiedler appointed a committee of five consisting of W. H. Driscoll, Arthur Ritter, H. B. Hedges, W. W. Timmis, and R. H. Carpenter to report back to the chapter at the next meeting on this matter.

Nominations for the chapter officers for the coming season were made by the nominating committee as follows: For president, W. W. Timmis; for vice-president, G. E. Olsen; for secretary, T. W. Reynolds; for treasurer, W. N. Heebner, and for board of governors, H. W. Fiedler, A. F. Hinrichsen and W. E. Heibel.

Boston Oil Men Addressed by Boiler Representatives

BOSTON — At the regular monthly meeting, March 11, of the Boston Oil Burner Associates, Granville Gilling, for 50 years with the American Radiator Company, and G. B. Gerrish, Fitzgibbons Boiler Company, were the guest speakers. Mr. Gilling, in his talk, reminisced of the days when at the foundry the moulds were mixed of beach sand, sour beer and molasses, instead of the fish oil and coarse sand used today. On one occasion good beer was delivered at the foundry by mistake for the sour liquid, and the casting operations were turned into a beer party.

Mr. Gerrish discussed the subject of steel tubular boilers, and told the members that fuel efficiency of steel boilers was on the whole high, and provided greater efficiency for a small weight of metal.

Housing Conference Urges Enabling Legislation

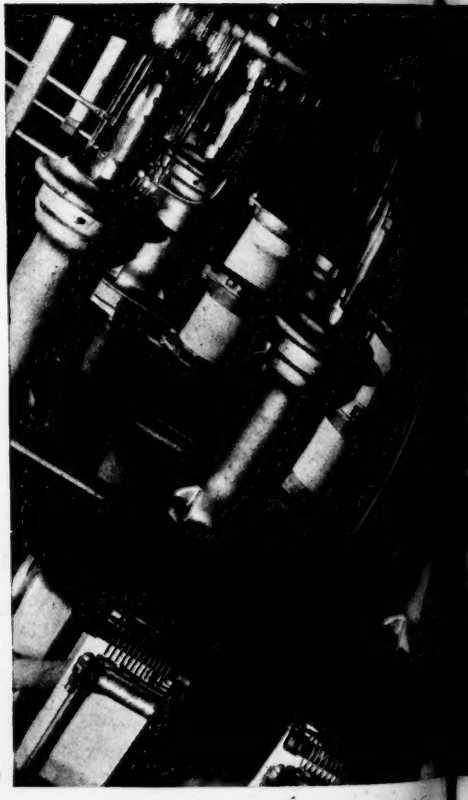
NEW YORK—State laws to enable the creation of local housing have become an imperative by the terms of the work relief bill now on the floor of the Senate, according to the National Public Housing Conference in an announcement March 15. With $450 million specifically allocated to the extension of the work of the Housing Division of PWA, and an additional $900 million available for "public projects of state and local governments," the Conference pointed to these provisions as emphasizing the need for public housing authority legislation in the 38 states still without such laws.

In calling for the passage of enabling legislation in these 38 states, the Conference continues the campaign begun with the passage of the New York law. This law was drafted and sponsored by the Conference and was the first time such legislation had been introduced in the United States. Nine other states—Delaware, Illinois, Kentucky, Maryland, Michigan, New Jersey, Ohio, South Carolina, and West Virginia — now have legislation patterned upon the New York law.

PICTURE

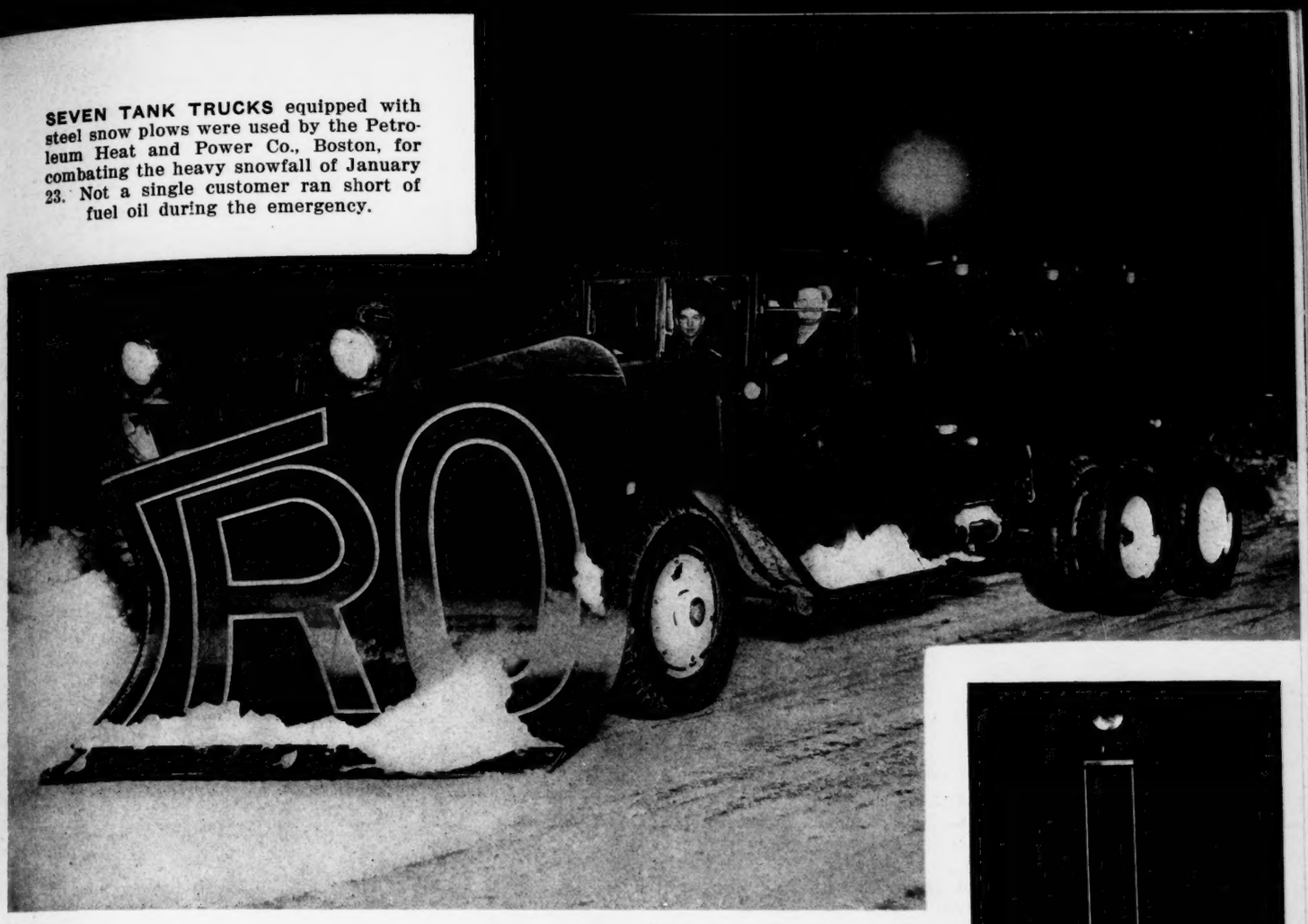
CAMOUFLAGED GRILLE is provided by this gold lacquered bronze Japanese temple which masks the exhaust duct for the ventilating system in the Nippon room of the Hotel Vendome, Boston. Heat is discharged into the room by means of grilles above the rails of the wall seats, air being drawn in at the bottom of the seats and passing over coils concealed behind the seats.

FACULTY of G.E. Air Conditioning Institute, where that company recently trained 187 dealer representatives and 130 power company men in air conditioning.

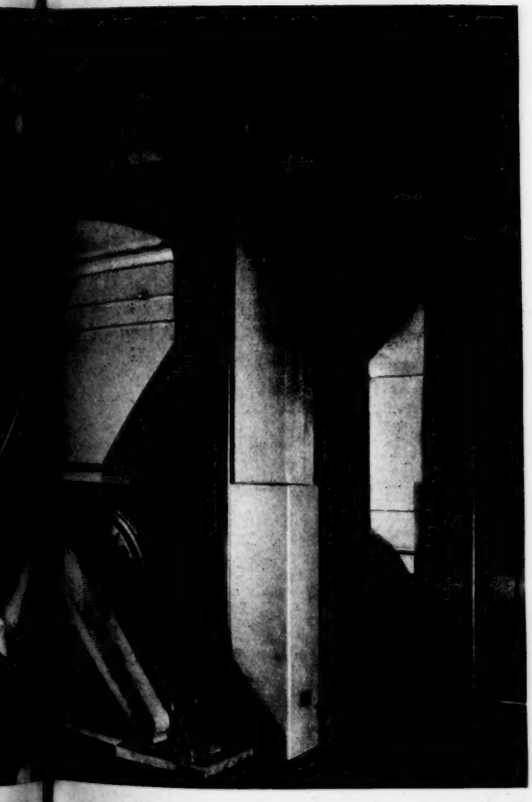


RADIO TUBES HEAT BUILDING. In the new 50,000-watt transmitter of WOR, Carteret, N.J., opened early in March, the building is heated by water which circulates around the power tubes shown above. The heavy bases on the tubes are the water jackets. Power tubes are 33% efficient and the remaining 67% of

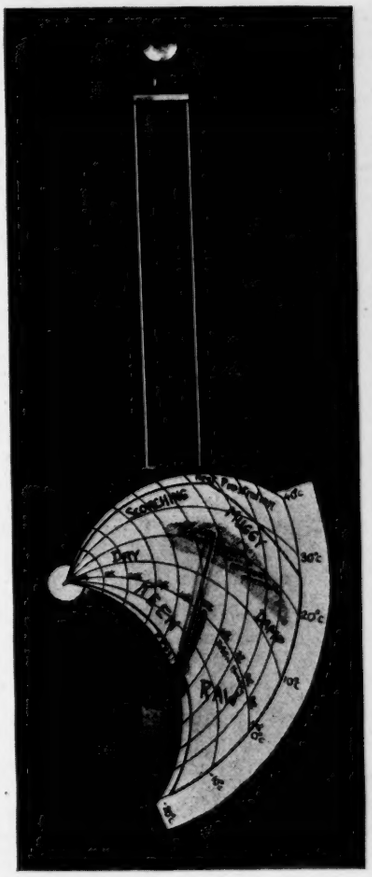
SEVEN TANK TRUCKS equipped with steel snow plows were used by the Petroleum Heat and Power Co., Boston, for combating the heavy snowfall of January 23. Not a single customer ran short of fuel oil during the emergency.



PARAGRAPHS

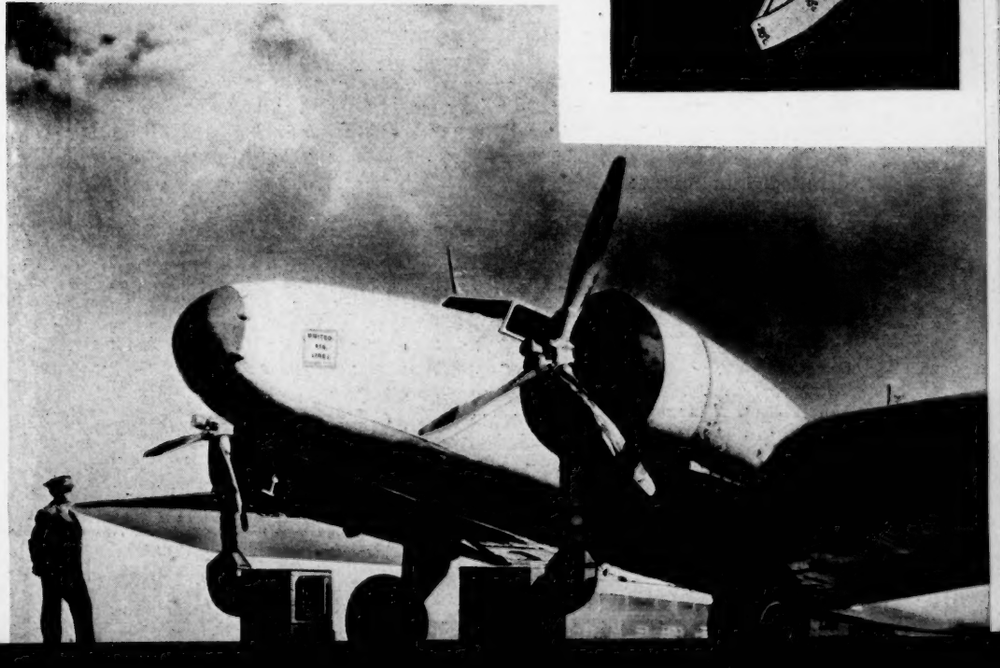


is thus reclaimed for heating. About 340,000 B.t.u. per hr. are given off by the tubes. The view above shows the circulating system. The plant was developed by Jack Poppele, chief engineer for WOR, in collaboration with Western Electric Engineers. Photos by Bourke-White.



AIR MASS INDICATOR (right) which identifies types of air mass overlying a region, registers prevailing weather conditions in terms of temperature and relative humidity (story on page 54).

ELECTRO-CONVECTION HEATERS shown below, designed for air-lines, are used to warm up motors to facilitate starting in cold weather. When not in use on the field, the heaters are utilized in the hangars. Photo courtesy Young Radiator Company.



Analyzer Developed at M.I.T. Interprets the Weather in Terms of Comfort and in Non-Technical Way

BOSTON—An instrument which analyzes temperature and relative humidity, and in a single reading indicates prevailing weather conditions in terms of personal comfort, has been developed at the Massachusetts Institute of Technology by Athelstan F. Spilhaus.

The device combines a bimetal thermometer and a hair hygrometer which, reacting to temperature and humidity, registers atmospheric conditions in a single reading. This air mass indicator is expected to be of value in indicating comfort zones of heat and moisture in air conditioned buildings, and to be valuable in a variety of other ways, such as warning air pilots of dangerous conditions of temperature and humidity in which ice begins to form on airplane wings.

This instrument does not make weather forecasts, but analyzes prevailing weather conditions in a locality in non-technical terms. The meteorologist knows air masses of the North American continent by such terms as polar continental, polar maritime, tropical continental, or tropical maritime air. The man on the street knows them by the atmospheric conditions he describes as scorching, muggy, damp, and so on. It is these terms that are used on the indicator to show weather conditions from day to day as the owner sees them. (See photo page 53.)

Its operation is based on the knowledge that indications of weather conditions are found by analysis of the great air masses of the atmosphere. These masses arise in various parts of the world, and their characteristics are so well known to meteorologists that each type has been given a name. They differ radically in temperature, moisture content, and direction of movement. Changes of weather, such as snow, rain, and wind, occur at the boundaries or fronts of these air masses when contrasting masses meet.

The air mass indicator or analyzer identifies the particular type of air mass prevailing in a locality and indicates the conditions it produces in terms of comfort as ordinarily expressed by temperature and humidity. Comfortable conditions in the summer, for instance, usually indicate that a polar continental air mass is overlying a region, while in the winter a tropical maritime air mass may be expected to produce pleasant conditions of temperature and humidity—in other words, mild weather.

One of the interesting features of the new instrument is that both the dial and the needle pointer move in the process of giving one reading. The dial, rising and falling, registers temperature, while the indicator finger moves to left or right in registering humidity. On the face of the dial is a series of curved lines, like those of latitude and longitude on a globe map of the world. The outside circle shows temperature degrees, ranging from 45° to —20°. The lateral curves indicate at different points on the dial, in connection with the temperature, the various weather phases popularly known as damp, raw, and so on.

Mr. Spilhaus, a native of Rondebosch, South Africa, was graduated from Capetown University in 1931, and in 1933 was awarded the degree of Master of Science at M. I. T. He is a research assistant of meteorology.

Pittsburgh Utility Adds 58 A. C. Jobs

PITTSBURGH — Fifty-eight air conditioning installations were installed in the territory of the Duquesne Light Company during 1934, as compared with 16 during 1933, and with 18 during the years prior to 1933, according to H. A. Canon, sales development department, Duquesne Light Company. The company now has 92 installations on its lines, totaling 4196.5 hp. The detailed data follow:

	Prior to 1933		1933		1934	
	No.	Hp.	No.	Hp.	No.	Hp.
Residences			2	6	11	9.5
Offices	2	2	9	25	27	106
Small stores	2	22	3	14	8	117
Large stores	1	590				
Restaurants	4	223	1	7	6	101.5
Theaters	7	2377				
Hotels (incl. restaurants)			1	1.5	2	23
Industrial	1	493			1	10
Miscellaneous	1	4			3	65
Total	18	3711	16	53.5	58	432

Order from Du Pont Rayon

BOSTON—Cooling & Air Conditioning Corporation has received an order from the Du Pont Rayon Co., Richmond, Va., for equipping the plant of that company with a complete air conditioning system. The spinning room of this plant is probably the largest single room of its kind in the country. Other air conditioning systems are being installed in the winding and carrier storage rooms.

A. B. C. Publishes Book on Air Conditioning

DETROIT—Covering the entire field of air conditioning and engineering, a 704-page technical book, complete with charts, photographs, drawings, and tables, is being published by the American Blower Corporation for the use of its organization and for reference purposes generally.

Declared by engineers who have seen advance copies to be the most complete book of its kind to appear in the air conditioning industry, the new American Blower volume goes into the various phases of air engineering and air conditioning thoroughly. Experience of the company's own engineers and data gathered from other reliable sources have been included, to bring about a complete and authentic library on the subject in one volume which eliminates the necessity for numerous reference books, tables, and data sheets.

Subjects covered include air, heat, steam, air flow, sound, heating, ventilating, humidifying, dehumidifying, cooling, control, vapor absorption, drying, etc. All subjects are indexed, charted, illustrated, and cross indexed, to permit easy research reference.

A review of the book will appear in the next issue of HEATING AND VENTILATING.

McCall Amendment May Not Pass

NEW YORK—McCall Bill, known as Senate Bill No. 258 (New York), which was later amended to strengthen the bill, the amendment being known as Introductory No. 326, remains in the hands of the joint legislative committee on the affairs of the City of New York, with no report having been made on the measure to the Legislature to date.

While there is no way of predicting the final disposition of this matter, it is felt that the measure will not be given a favorable report in this year's Legislature.

Senator McCall's amendment would give jurisdiction over oil burner installations to the five borough building commissioners. Oil burner men favor the idea of such work coming under the bureau of combustibles of the fire department.

Clyde Miller Associates Formed

WASHINGTON—Clyde H. Miller Associates, 726 Jackson Place N. W., has been formed to act as manufacturers sales representatives in this city, nearby Maryland and Virginia. They will represent Burnham Boiler Corporation; Radiant Steel Products Company; Rome Radiation Company, and The Columbia Mills, Inc.

New York Has 85,978 Commercial Buildings

NEW YORK—Interesting facts about this city's commercial buildings are contained in a report on the non-residential survey of the Real Property Inventory made public recently by the New York City Housing Authority. The data show that there are 85,978 commercial structures in the city ranging from wooden frame structures to towering skyscrapers.

The total of 85,978 commercial and non-residential structures is made up as follows:

Lofts	8,271
Office buildings	2,691
Warehouses	4,518
Store buildings	22,595
Hotels	483
Rooming houses	12,559
Factories	8,822
Commercial garages	8,165
Miscellaneous	17,874

The survey listed 18,614 non-fireproof structures in the city of which 4,598 are wooden frame. Brooklyn has 6,698 non-fireproof buildings as against Manhattan's 5,272, Kings leading all boroughs in the city in this respect.

Of 168,489 retail stores throughout the city 62,667 are in Brooklyn and 51,290 in Manhattan. Bronx has 26,458; Queens 24,074 and Richmond 4,000.

Detailing figures on office buildings, the statement declares: "The city's 2,691 office buildings have a combined floor space of 140,792,000 sq. ft. of which 111,048,000 sq. ft. are rented. Nearly 27% of all available office space is vacant. The trend from downtown office buildings to recently erected midtown structures is clearly evidenced in the inventory figures.

"The city's 483 hotels, while residential in character are commercial and were included in the present inventory. They have a total of 125,058 rooms of which 88,278 were occupied at the time the survey was made. Accommodation for visitors to the city is further supplied by 12,559 rooming houses which contain 175,980 rooms.

"The New York's commercial structures, according to the survey, have a daytime or working population of 2,149,600, and the city's transportation congestion is explained by the fact that 69.9% or 1,504,626 work in Manhattan buildings."

Less than 2% of all warehouse space in the city is refrigerated.

Abrams Heads Insulating Firm

EAST ORANGE, N. J.—Robert E. Abrams has been made president of the Woolsulate Insulating Company, Inc., a state-wide organization with main offices at 441 Main St., East Orange. Mr. Abrams has been actively engaged in the air conditioning field for the last three years and in 1931 organized the Air Conditioning Sales Company of New Jersey.

Buensod Addresses Joint Meeting in Boston

BOSTON—A joint meeting was held in the William Filene's Sons Company store auditorium March 11 of the Boston chapters, A.S.H.V.E., A.S.M.E., A.S.R.E., and American Institute of Electrical Engineers. John F. Maxwell was in charge of the program, which included a talk by A. C. Buensod, Carrier Engineering Corporation, on "Technical Features of Air Conditioning as Applied to the Modern Department Store." Mr. Buensod's paper dealt almost exclusively with the system of the Filene store, part of which is already in operation, and was illustrated by slides of the design and equipment used in the installation.

At the conclusion of the talk the entire group was taken on a tour of the store to inspect the system, from the refrigeration apparatus room in the sub-basement to the cooling tower on the roof.

24 A.C. Systems Now in Use in Miami

MIAMI—Twenty air conditioning jobs were installed in this city in 1934 whereas there were only four jobs installed prior to 1934, according to D. P. Caldwell, division sales manager, Florida Power & Light Company. This city now has over 561 tons of refrigeration connected to air conditioning systems. The 20 installations made during last year cost approximately $67,535.

A summary of these installations is included below.

The dealer members of the Air Conditioning Council of South Eastern Florida agreed, after a comprehensive study of weather conditions, to use 91° dry bulb temperature and 79° wet bulb temperature for design temperature. Miami has the lowest high temperature and the highest low temperature of any city in Florida. There is very little difference between day and night temperature.

Air Conditioning Show

CHICAGO—The National Air Conditioning Show, to be held in the Merchandise Mart, Chicago, the week of May 20, is well under way. The object of the show, which is sponsored by the National Society of Air Conditioning Engineers and held concurrently with its annual convention, is stimulation of interest with resultant sales of air conditioning equipment.

It is endorsed by the Chicago Master Steam Fitters' Association and the Ventilating and Air Conditioning Contractors' Association of Chicago.

J. C. Hines, R. B. Hayward Co., Chicago, is chairman of the show committee. His associates are: M. L. Brown, superintendent and chief engineer, Palmolive Building; A. E. Christophersen, chief engineer, Franklin School; Carl Eichstaedt, vice-president and manager sales, Reliance Refrigerating Machinery Company; Dr. E. V. Hill, president, E. V. Hill Company; H. G. Kreissl, manager, Vento and Arcoblast depts., American Radiator Company; G. D. Ladd, buyer, air conditioning dept., Montgomery Ward & Company; J. F. McCabe, superintendent, Art Institute; Fred Peterson, Merchandise Mart; Charles Rickner, E. V. Hill Company; H. E. Ziel, chief engineer, Albert Kahn, Inc., Detroit; W. R. Lewis, air conditioning engineer.

Summer Temperature Chart for Chicago

CHICAGO—On page 44 of the March, 1935, issue of HEATING AND VENTILATING appeared a chart showing the daily record of the temperature and humidity for Chicago from May to October, 1934. In the explanation of the development of this chart, given on page 45, reference to its originator was omitted. The origin of the form of the chart is not definitely known. The particular chart reproduced was developed by Knight C. Porter, air conditioning division, Commonwealth Edison Co., Chicago.

	Prior to 1934			1934			Total		
	No.	Tons	Hp.	No.	Tons	Hp.	No.	Tons	Hp.
Funeral homes	0	0	0	2	12	16.7	2	12	16.7
Beauty shops	0	0	0	2	34.6	29.5	2	34.6	29.5
Dept. stores	0	0	0	2	112.5	144.5	2	112.5	144.5
Stores	0	0	0	2	33.7	37.8	2	33.7	37.8
Restaurants	1	33.3	50	2	17.4	23.0	3	50.7	73
Utilities	0	0	0	1	8	14.0	1	8	14.0
Industrial	0	0	0	1	2	2.2	1	2	2.2
Commercial offices	0	0	0	1	1	1.1	1	1	1.1
Private offices	0	0	0	3	2.5	2.8	3	2.5	2.8
Broadcasting	0	0	0	1	19	24.8	1	19	24.8
Theaters	3	283.	425	0	0	0	3	283.	425
Residences	0	0	0	1	.75	1.1	1	.75	1.1
Apartments	0	0	0	2	2	2.1	2	2	2.1
Total	4	316.3	475	20	245.45	299.6	24	561.75	774.6

Figures above are actual figures. The tonnage is based on the manufacturers' ratings under the conditions the compressors operate. The horsepower is the nameplate ratings of the motors connected. Load tests have shown that in many cases the motors operated overloaded; that is, the horsepower output of the motor is in excess of its nameplate rating. This fact accounts for the approach to one ton per horsepower.

Fourth H. & V. Exposition to be Held in Chicago

NEW YORK — The Fourth International Heating and Ventilating Exposition will be held in Chicago, at the new International Amphitheatre, January 27-31, 1936. Since its inception in 1930 this exposition has been held every two years. The first showing was in Philadelphia, the second in Cleveland, and the third, in 1934, was held in New York.

Significant this year to prospective exhibitors who are now reserving space for the Chicago event next January, is the evident growing national demand for modern heating and ventilating equipment. Remarkable developments and innovations in many types of air conditioning apparatus during the past few years are partly responsible for widespread manifestations of consumer interest.

Looking ahead, it is conservative to predict that the number of exhibitors and visitors at the exposition in Chicago will reach a new high. The location, in the midwest, where renewed business activity and signs of industrial recovery are specifically apparent, should bring forth many new participants, both those who will find the Illinois location an established market and those who will find it a new one. The great Amphitheatre is a new structure and provides an especially desirable place in which to hold expositions.

The exposition advisory committee is comprised of the following: John Howatt, chairman, F. H. Gaylor, A. B. Martin, J. M. Frank, E. M. Mittendorff, J. R. Vernon, and R. E. Hattis.

The conduct of the exposition and all details of exhibit arrangement and leasing will be in charge of the International Exposition Co., Grand Central Palace, New York, and will be under the personal direction of Charles F. Roth, manager, who was similarly responsible for the earlier expositions.

Milener Addresses Ontario Chapter

TORONTO, ONT.—Nearly 60 members and visitors were present at the meeting of the Ontario chapter of the A.S.H.V.E., held in March. Features of the evening were the naming of the officers for next year as well as addresses on air conditioning. Included in the latter was a talk by Eugene D. Milener, of the American Gas Association of New York, who discussed "Automatic House Heating and Air Conditioning."

For officers, the nominating committee proposed: President, M. W. Shears; vice-president, Thomas McDonald; secretary-treasurer, H. R. Roth; board of governors, Messrs. Playfair, Jenney, W. Blackhall, and Henion.

Soling Forms Own Company

NEW YORK—Soling Heating & Cooling Company, heating, ventilating, and air conditioning contracting company, has been formed by William Soling, formerly chief engineer for Reis & O'Donovan. The company has opened offices at 227 East 45th Street.

Detroit A. C. Installations Increased 88% in 1934

DETROIT—There was an increase of 88% in the number and 195% in the horsepower of air conditioning systems installed in this city in 1934, as compared with those put in in 1933, according to S. S. Sanford, sales engineer of the Detroit Edison Company.

Installations involving use of cold water from deep wells are becoming more popular in Detroit and installations of this type to date are as follows:

	Prior to 1934		1934	
	No.	Tons of Refrigeration	No.	Tons of Refrigeration
Theaters	1	85	4	426
Night clubs	1	16	—	—
Restaurants	—	—	1	66
Candy stores	—	—	3	160
Misc. stores	—	—	1	133
	101		9	785

A list of the detailed installations follows. In addition to the compressor installations which are listed there was a 167-ton steam jet installation installed in the Hotel Statler last year, and a 14-ton steam jet installation installed in a restaurant prior to 1933.

Overton Addresses Chicago Group

CHICAGO — Platte Overton spoke on air conditioning in existing homes before the Illinois chapter, A.S.H.V.E., at its monthly meeting March 11. About 112 members and guests attended.

Mr. Overton outlined a number of experiences he has had in installing air conditioning in old homes. He stated that the system must be designed around one room, its requirements determining the air temperature, velocity, and volume and the size of the boiler. In many cases, he found the ducts too small, requiring extremely high velocities; also coordination of different parts of systems appeared difficult, with dampers functioning not without trouble.

The speaker's talk was followed by numerous questions.

The teller reported on the results of the election of the nominating committee. The following were elected: John Howatt, John Aeberly, J. J. Hayes, C. W. DeLand, H. R. Linn, R. E. Hattis, and J. H. Milliken.

Chicago Store to Modernize

CHICAGO—Carson Pirie Scott & Company, March 18, announced an extensive program of improvements for its retail store, to cost nearly $1.5 million, and include air conditioning, escalators, new elevators, and an entirely new heating and power plant.

	Prior to 1933		1933		1934		Total	
	No.	Hp.	No.	Hp.	No.	Hp.	No.	Hp.
Offices	14	39	14	49½	20	136	47	224½
Office buildings	2	960	—	—	—	—	2	960
Restaurants	11	291	3	60	6	109	19	460
Night clubs	2	15	—	—	2	25	3	40
Hotels	5	712	1	10	1	20	6	742
Residences	10	41½	7	14	18	24¾	45	80¼
Department stores	3	3353	—	—	1	30	4	3383
5c to $1 stores	1	40	—	—	1	120	2	160
Furniture stores	1	12	—	—	—	—	1	12
Candy stores	3	11½	2	15	2	42½	7	69
Drug stores	—	—	3	47½	2	9½	5	57
Jewelry stores	1	1½	2	16	2	15	5	32½
Opticians	—	—	—	—	2	2	2	2
Clothing stores	1	3	2	15	9	100	11	118
Miscellaneous stores	1	20	—	—	—	—	1	20
Electric Co. sales offices	2	34	—	—	1	7½	3	41½
Radio stations	—	—	1	1½	—	—	1	1½
Theaters	14	3630	2	40	1	45	17	3715
Library	—	—	—	—	1	4	1	4
Banks	3	600	—	—	—	—	3	600
Stock exchange	1	50	—	—	—	—	1	50
Broker's room	1	75	—	—	—	—	1	75
Barber shops	1	30	—	—	—	—	1	30
Beauty parlors	—	—	1	5	1	5	2	10
Hospital	1	60	—	—	—	—	1	60
Laboratories	2	53	—	—	—	—	2	53
Drug manufacture	1	575	—	—	2	7	3	582
Candy manufacture	—	—	1	1	1	8¼	2	9¼
Roller bearing mfg.	—	—	—	—	1	50	1	50
Printing	—	—	—	—	1	20	1	20
Undertaking parlors	1	3	2	6	2	25	5	34
	82	10,609½	41	280½	77	805½	195	11,695½

(The above data are for compressor installations only. The horsepower is for compressors only and does not include fans or pumps. In some cases additions have been made to existing installations so the total number of installations in the last column is not always the sum of those in the other columns.)

WITH THE MANUFACTURERS . . . .

AIRTEMP, INC., New York, has appointed Woodson & Bozeman as distributors of its air conditioning products in Memphis, and 70 counties in Tennessee, Arkansas and Mississippi. The company, with headquarters in the Hotel Peabody, Memphis, is headed by E. D. Bozeman, Jr., and E. G. Woodson. Louis T. M. Ralston, former New York consulting engineer, has joined the firm as vice-president in charge of engineering. Other officers in the company are W. G. Erskine and Ben G. Humphries.

Airtemp has also appointed the Chicago Airtemp Corp., Builders' Building, Chicago, with W. C. Toomey as general manager, exclusive distributor for northern Illinois, northern Indiana, and southwestern Michigan.

AMERICAN RADIATOR CO., New York, has appointed J. E. Lamping manager of its Cleveland branch, succeeding L. O. Stearns, who has been transferred to sales headquarters in New York. Mr. Lamping has been with American Radiator Co. since 1907. Since 1928 he has been located at Cleveland.

American Radiator also announces that it has formed a new division in its sales department to increase the company's service to contractors on specialty and other new products placed on the market in recent years, according to A. R. Herske, vice-president and general manager of sales. R. F. L'Hote, assistant general manager of sales, has been appointed manager of the division, which will be known as the allied products division. It will supervise the company's activities in the development of markets for such products as copper pipe and fittings, cast-iron pipe accessories, air and vacuum valves, thermostatic controls, damper regulators, concealed radiators, and similar products.

R. F. L'Hote

CARRIER ENGINEERING CORP., Newark, N. J., has added Paul E. Holcombe to its staff to develop a program of sales research and sales promotion. Mr. Holcombe was formerly research engineer of the National Association of Building Owners and Managers.

DELCO APPLIANCE CORP., Rochester, N. Y., has appointed George W. Faurie manager of sales education of its Delco-Heat division. Mr. Faurie had been assistant manager of the department, which was formerly known as the sales promotion department.

Prior to joining the factory organization, Mr. Faurie was sales promotion manager of General Appliance Corporation, New York distributor for Delco. He is a graduate of the Colorado School of Mines and the University of Wyoming. After his graduation he worked in the mining and oil fields of the Rocky Mountain region. Since entering the field of automatic heating, he has been salesman, supervisor, and sales promotion manager.

GAR WOOD INDUSTRIES, INC., has appointed E. H. Rand manager of its Boston branch. Mr. Rand was formerly sales manager for Air Conditioners, Inc., of Boston.

KELVINATOR CORP., Detroit, has appointed J. K. Knighton as manager of its air conditioning sales department. Mr. Knighton is well known throughout the electric refrigeration industry through a number of years of special field work, and equally well known in the air conditioning field, where his work has brought him in close contact with air conditioning dealers and their merchandising problems.

J. K. Knighton

THE MERCOID CORP., Chicago, has appointed J. N. Derby, Jr., vice-president in charge of sales in the eastern territory, with headquarters at 90 West St., New York. Mr. Derby succeeds Nelson J. Allaben, who recently resigned to join Preferred Utilities, Inc.

Mr. Derby was for the past seven years western manager of the Mercoid Corporation and located in San Francisco.

READING IRON CO., Reading, Pa., has announced the formation of a commercial research department whose services are available without charge to engineers who specify or buy pipe. Their conclusions are based on the service records of various kinds of pipe under the conditions specified by the user.

REPUBLIC STEEL CORP., Youngstown, Ohio, has appointed Atlas Supply Co., Inc., 35-39 Woodward Ave., Brooklyn, N. Y., as warehouse distributor of Toncan iron sheets.

C. J. TAGLIABUE MFG. CO., Brooklyn, N. Y., has opened a branch factory at 1916 Jackson St., Dallas, Tex. This branch takes the place of the company's old Shreveport, La., office which has been closed. The prime function of this new branch factory will be repair work, with special attention to emergency orders. Stocks will be maintained. A. G. Koenig, southwestern district manager for Tagliabue, will be in charge at Dallas.

UNITED AIR CONDITIONING SALES CORP., New York, metropolitan distributor for Airtemp air conditioning equipment has appointed Andre Merle as head of its engineering staff.

Train Heating Shed for British Railroad

LONDON—The Southern Railroad of England has decided to construct a special train warming shed behind the large passenger and cargo sheds at Southampton Docks. The new shed will enable transatlantic boat trains to be heated to the same temperature as that of the liner from which the passengers will disembark. The shed will be 759 ft. long and 98 ft. wide and will accommodate six boat trains, each consisting of 12 cars, on six tracks. The shed constitutes an innovation in British railroad practice, and may be followed by similar structures at other centers.

Wetzell Talks on Welding

CLEVELAND—H. E. Wetzell, chief engineer of Smith & Oby Company, was the speaker at the February 26 meeting of the local chapter, A.S.H.V.E. He spoke on Welding. Mr. Wetzell has been a pioneer in welding as applied to piping installations and gave an interesting account of the progress of pipe welding during the past 12 years. For the first few years there was not only the opposition of engineers, architects, and owners to overcome, but so little was known regarding this type of work, that each job would present new problems to solve without the aid of present-day standards.

A detailed description of both the oxy-acetylene and electric arc welding processes were given with the advantages and disadvantages of both processes and explaining various types of work where one system would be better suited than the other. A comparison was made among a welded pipe job, and a screwed installation and a flanged job.

Present day pipe welding has been simplified to a great extent mainly by the fabrication and standardization of welding fittings. The speaker had a complete display of standard welding fittings and examples of poor workmanship found on jobs where qualified workmen were not employed. A series of slides were shown illustrating the history of pipe welding. These were taken during the construction of local jobs and the apparent improvement shown in even a few years has proven the wisdom of the early work of the standardization committee.

Campaigns for Permanent Department of Public Works

NEWARK—Dr. D. B. Steinman, president of the National Society of Professional Engineers, announced the start of a campaign for the establishment of a permanent Federal Department of Public Works when he addressed the annual convention of the New Jersey Association of Professional Engineers here March 16.

"Advance planning and proper coordination are essential factors in making a national program of public works fully effective in correcting the sags in the business cycle," he said. "If such a long-time program of construction planning and administration had been set up 10 years ago, the present depression could have been avoided or speedily terminated.

"The general public does not realize that most of the present unemployment arises from the cessation of the normal volume of construction activities and the allied heavy goods industries. Until private enterprise and confidence are restored, government initiative in this field is necessary for recovery."

He said the engineering profession advocates the creation of a permanent Department of Public Works in the national government and the addition of a Secretary of Public Works to the President's Cabinet.

Dr. Steinman announced that nine state societies of professional engineers, aggregating more than 4,000 members, had recently become affiliated with the National Society of Professional Engineers. He added that the organization was assisting 16 states to obtain engineers' registration laws. 28 states have such legislation.

Scranton Added 5 A.C. Jobs in '34

SCRANTON, PA.—Five air conditioning installations were made in this city during 1934, according to D. W. Crawford, of the Scranton Electric Company. These consisted of the following:

	No.	Hp.	Tons
Jewelry store	1	8½	7½
Chain store	1	17	15
Offices	2	4½	3½
Printing plant	1	17	15
TOTAL	5	47	41

Philadelphia Utility Promotes A. C.

PHILADELPHIA—Continuing its active work of promoting the sale and use of air conditioning equipment, the Philadelphia Electric Company has prepared a series of direct-by-mail pieces. These are circulated to selected lists in the territory sold by the company. Close follow-up is maintained of all inquiries received. Mailing pieces are carefully laid out in modern attractive form.

Richmond Adds 25 A.C. Jobs

RICHMOND, VA.—Twenty-five air conditioning installations were made in this city during 1934, according to Charles Millhiser, II, air conditioning engineer, Virginia Electric and Power Company. These installations were as follows:

Classification	No.	Installed Hp.	Tons of Refrigeration
Drug stores	1	15	14
Theaters	1	55	45
Department stores	2	1050	750
Specialty stores	3	15	12
Residences	11	12	11
Restaurants	1	45	35
Hospitals	1	5	4
Funeral parlors	1	25	20
Offices	3	10	8
Laboratories	1	35	25
TOTAL	25	1267	924

Pennsy to Have 537 A.C. Pullmans

CHICAGO—The Pullman Company will raise its quota of air conditioned cars assigned to the Pennsylvania Railroad, giving the road a total of 537 air conditioned Pullmans. All through trains of the road will be completely air conditioned. To date 272 cars have been air conditioned, 78 more will receive this equipment during the spring, and the total number will later be brought to 887 cars.

Air Conditioning Jobs Increase in Volume

BALTIMORE — Seventy-four air conditioning systems with an installed horsepower of 1973 were placed in service in Baltimore during 1934, according to information furnished by R. H. Tillman, manager of the new business department, Consolidated Gas Electric Light and Power Company of Baltimore. Approximately 85% of the total installed power is used for refrigeration purposes.

In number of installations those in offices led other classifications with 13 jobs installed during the past year. This was closely followed by theaters in which 12 systems were installed.

A summary follows:

	Prior to 1934		During 1934		Total	
	No.	Hp.	No.	Hp.	No.	Hp.
Barber shops—Beauty parlors	2	2	3	37	5	39
Drug and confectionery stores	2	15	4	80	6	95
Department stores	1	165	6	723	7	888
Food stores	0	0	5	20	5	20
Public buildings	2	340	2	60	4	400
Hospitals	2	23	2	24	4	47
Industrial	9	494	0	0	9	494
Restaurants, etc.	10	194	8	116	18	310
Offices	13	57	13	163	26	220
Banks and brokerage houses	8	478	0	0	8	478
Residential	8	18	6	6	14	24
Specialty apparel shops	3	9	9	109	12	118
Theaters	10	1,764	12	612	21*	2,358
Miscellaneous	3	67	4	23	7	90
TOTAL	73	3,626	74	1,973	146	5,581

*One theater demolished during 1934—18 hp. connected.

Building Exposition for Frisco

SAN FRANCISCO—Backed by the San Francisco Builders Exchange, one of the largest and strongest organizations of its kind, and carrying the endorsement of the Federal Housing Administration, the annual building exposition and convention, May 4-12 inclusive, promises to be outstanding.

The exposition is planned as the contribution of the building industry of the city toward the success of the Federal housing program and dovetails with the plans of the Federal Housing Administration to increase popular interest in this nationwide movement.

Featured in connection with the exposition will be numerous conventions and meetings of organizations of architects, engineers, contractors, homeowners and apartment house and hotel owners, and managers, garden associations, and other similar groups.

Drive on Gas A.C. in Hartford

HARTFORD, CONN.—The Hartford Gas Company and S. N. Tychsen, Hartford representative of the Carrier-Lyle Corporation, with offices at 100 Allyn Street, have launched a cooperative campaign to develop gas-fired air conditioning business in greater Hartford. A number of domestic installations have already been completed. Extensive newspaper advertising has been used in connection with the campaign. H. R. Carlson is commercial manager of the gas company.

BRIDGEPORT, CONN.—Intensive promotion of gas house-heating has been launched by the Bridgeport Gas Light Company in connection with its resumption of active merchandising in the appliance field. Large showrooms have been opened in the company's office building at 815 Main Street, with Bryant conversion burners, boilers, and humidifiers and Clow Gasteam radiators among the appliances on display. Two men have been assigned to service in the division, under supervision of R. A. Malony, sales manager.

Building Materials Sales Course Started

BOSTON — A new course designed primarily to prepare men to take employment as building materials salesmen was started February 7 under the auspices of the University Extension Division, Massachusetts State Department of Education. The course will comprise eight weekly evening lectures, at Massachusetts Institute of Technology, and will be conducted by Lewis A. Estes, district manager of the Truscon Steel Company. Subjects to be covered are: qualifications for success in selling building products; review of previously used methods; reasons for changes; price cutting; chiseling; lack of market; introduction to changes brought about by legislation; analysis of the National Housing Act; the construction code; various material codes; important changes in selling methods; PWA regulations; what products to handle; with whom to make connections; where and how to get prospects, sales information; how some men have done the job; practical examples of success under present conditions; comparison of three types of sales employment—the salaried job, commission selling, buying and selling for own account.

The course is entitled "New Opportunities in Selling Building Materials."

Oil Prices

BALTIMORE—Effective February 27 Standard Oil Company of New Jersey reduced the terminal and tank car price of Essoheat light ¼ cent to 6 cents per gal.

BALTIMORE—Effective March 1, Standard Oil Company of New Jersey reduced the terminal and tank car price of industrial fuel oil to 4 cents; distillate fuel oil to 4½ cents; Essoheat medium to 4½ cents, and No. 4 oil to 4½ cents per gal.

PHILADELPHIA—Tank-wagon prices of Nos. 1, 2, and 4 heating oil were reduced ½ cent a gallon here March 11. The new prices are 6½, 5½, and 5 cents, respectively.

NEW YORK—Effective March 7, Standard Oil Company of New Jersey reduced the terminal and tank car price of No. 1 oil at Norfolk and Charleston from 6¼ to 6 cents per gal.

NEW YORK — Effective March 15 Standard Oil of New Jersey reduced the tank car and terminal price of its light fuel oil ¼ cent per gal. at New York, Baltimore, Norfolk, and Charleston. Medium is now selling for 4¼ cents per gal. at New York and Baltimore and 4½ cents at Norfolk and Charleston, while light is selling for 4½ cents per gal. at all of these ports.

195 A.C. Jobs in Manhattan and Bronx in '34

NEW YORK—There were 195 air conditioning jobs installed in the boroughs of Manhattan and the Bronx during 1934, totaling 7650 hp., according to S. Bennis, manager of the commercial engineering bureau, The New York Edison Company. These figures do not include those jobs installed in Brooklyn or Queens.

In number of installations, office buildings lead, with 58 jobs, closely followed by restaurants, in which 49 systems were put in. Fourteen residences were conditioned during the year. The summary follows:

CLASSIFICATIONS	No.	HP.
Banks	6	377
Beauty parlors	1	9
Brokers offices	1	2
Department stores	4	1230
Hospitals	—	—
Industrial	7	121
Office buildings	58	2813
Miscellaneous	15	525
Residences	14	50
Retail stores	20	250
Restaurants	49	1904
Showrooms	11	78
Theaters	9	291
TOTALS	195	7650

COMING EVENTS

APRIL 8-9, 1935. *Twelfth Annual Convention of the American Oil Burner Association, Claridge Hotel, Atlantic City, N. J.*

MAY 20-22, 1935. *Annual convention of the Heating, Piping and Air Conditioning Contractors National Association, Hotel Gibson, Cincinnati, Ohio.*

MAY 20-25, 1935. *Second Annual Convention and Air Conditioning Show of the National Society of Air Conditioning Engineers, Merchandise Mart, Chicago, Ill.*

MAY 22-24, 1935. *Twenty-Second Annual Spring Convention of the American Society of Refrigerating Engineers, Hotel Statler, Detroit, Mich.*

JUNE 11-14, 1935. *Annual Convention of the National District Heating Association, Bellevue-Stratford Hotel, Philadelphia, Pa.*

JUNE 17-19, 1935. *Semi-Annual Meeting of the American Society of Heating and Ventilating Engineers, Royal York Hotel, Toronto, Canada.*

JUNE 19-21, 1935. *Semi-Annual Meeting of the American Society of Mechanical Engineers, Cincinnati, Ohio.*

JUNE 25-27, 1935. *Fifty-Third Annual Convention of the National Association of Master Plumbers, Stevens Hotel, Chicago, Ill.*

OCTOBER 14-18, 1935. *Seventeenth Annual Convention of the American Gas Association, Atlantic City, N. J.*

JANUARY 27-31, 1936. *Fourth International Heating and Ventilating Exposition, International Amphitheatre; Chicago, Ill.*

AOBA Schedules Program for 12th Convention

NEW YORK — The program for the 12th annual convention of the American Oil Burner Association, to be held at the Claridge Hotel, Atlantic City, April 8-9, is as follows: April 8, 2 p.m. —meeting of the board of directors; April 9, 9:30 a.m.—annual meeting and election of directors; 10:30 a.m.—meeting of the new board of directors. At 2:30 p.m., April 9, there will be a manufacturers conference open to members and non-members of the association.

The nominating committee appointed by President Sherman at the January meeting has reported the following manufacturer nominations:

For directors (three-year term): W. F. Brannan, Anchor Post Fence Co.; J. J. Donovan, General Electric Co.; A. J. Fleischmann, May Oil Burner Corp.; C. N. Lockwood, Nu-Way Corp.; Earl Marr, Franklin Oil Heating, Inc.; M. A. Powers, Timken Silent Automatic Co.; W. J. Smith, Cleveland Steel Products Corp.

For officers (one-year term): President, W. J. Smith; vice-presidents, W. F. Brannan, J. A. Lattner, E. A. Halbleib, M. F. Cotes.

For executive committee (one-year term): W. J. Smith, R. M. Sherman, J. J. Donovan, M. F. Cotes, A. J. Fleischmann.

Contractors to Convene in Cincinnati

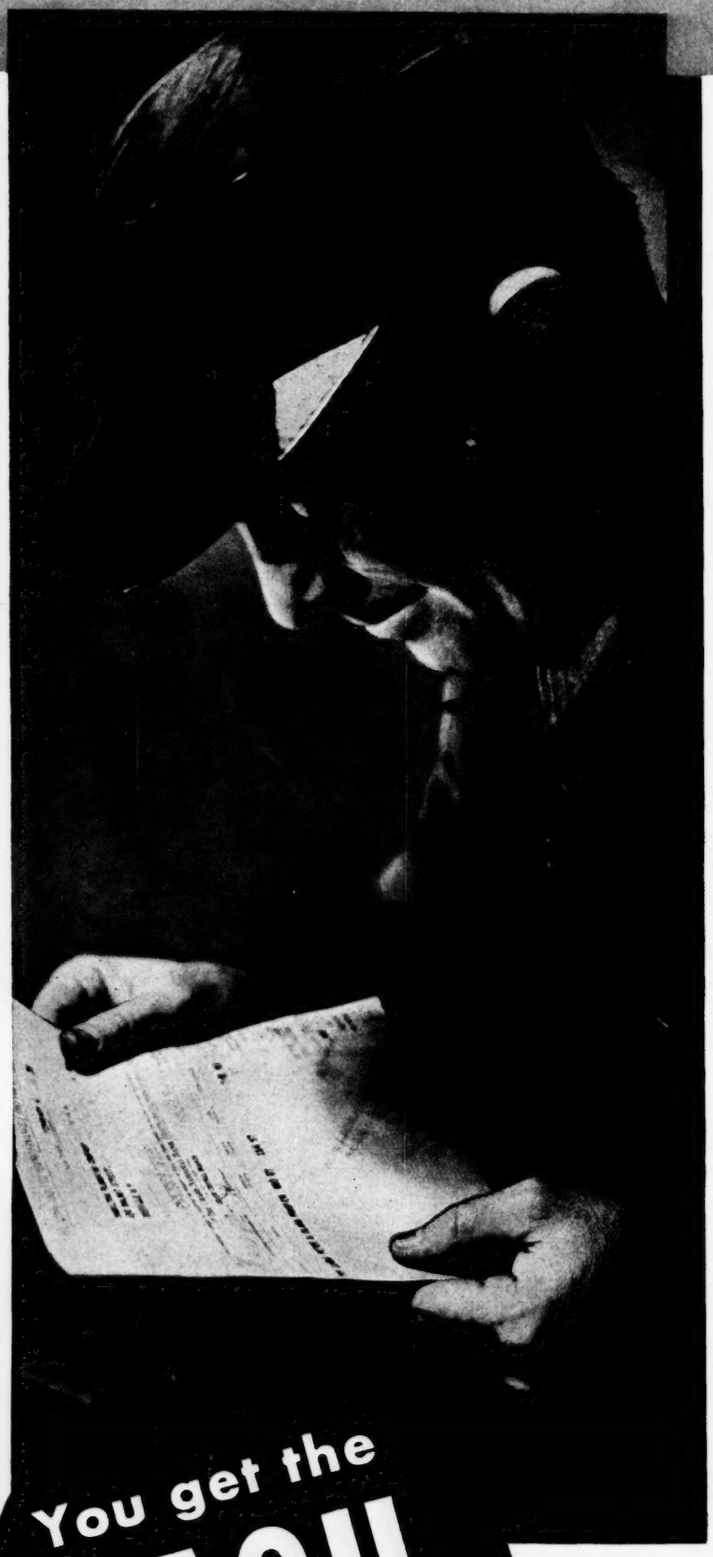
NEW YORK—The Heating, Piping and Air Conditioning Contractors National Association will hold its 46th annual convention in Cincinnati, May 20-22, with headquarters at the Hotel Gibson. Manufacturers and non-members are invited to attend the sessions. A full program, with addresses by authorities on their respective subjects and reports of officers and committees, has been planned. The local convention committee is making plans for the entertainment of members and guests.

Short Course in Coal Utilization

URBANA, ILL.—The College of Engineering of the University of Illinois, through its department of mining and metallurgical engineering and department of mechanical engineering, will offer another short course in coal utilization here June 11-13. The registration at last summer's short course was 146, and included men from states as far distant as Utah, Alabama, and Pennsylvania.

There will be no charge for tuition or registration. The program is now being prepared and will be in final form early in April.

THIS TIME PAYMEN



You get the
CASH
— no recourse
— no fees
— ...tbacks

We give the
CREDIT
— assume responsibility for in-
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PLAN MEANS CASH

To You-

SPECIAL PLAN OF
AMERICAN RADIATOR COMPANY

[approved by the FHA]

MAKES EVERY TRANSACTION AN ACTUAL **CASH** *SALE . . .*

THE finance plan for selling American Radiator Heating on time payments really should be called a "Cash-to-the-Contractor" Plan. That's just what it is, because it enables you to sell on time payments and get *your* cash in full. In fact, you get your cash even more promptly than in most so-called "cash sales", because a check for the *full amount* is sent to you immediately upon completing the installation. There are no hold-backs—no recourse—no collection fees—no legal expenses. You are really putting your business on a cash basis by selling on time payments.

Forget all the old ideas about time payment selling when you consider this plan. Think of it as a cash sale plan as far as you are concerned, because *you* get cash while *we* give your customer time to pay. You are free to devote your time to sales and installation without fuss or worry about collections. Go after this "cash" business *now* with this special finance plan! Write today for a supply of the simple forms required!

Your customer has
TIME TO PAY
As long as 3 years to pay on low FHA terms

AMERICAN RADIATOR COMPANY

40 West 40th Street, New York, N. Y.

Division of AMERICAN RADIATOR & STANDARD SANITARY CORPORATION

NEW EQUIPMENT

Airtemp Self-Contained Unit

A self-contained air conditioning unit with a capacity of ½ ton of refrigeration has been developed for Airtemp, Inc., by Chrysler Motors. This unit, low in height, fits below the windowsill.

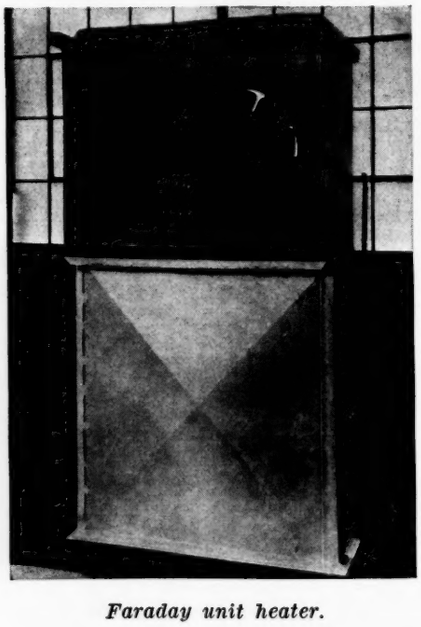
Air is taken in through the front of the unit and is blown out through a grille located in the center of the cabinet top. It can also be built in under the window itself, thus eliminating the containing cabinet.

One of the features of this self-contained conditioner is that it is "semi-movable." It is quiet in operation. The motor and compressor are mounted on a separate frame from the one which supports the coils, and the unit mounted on a cork base. Convenient switches are located on top of the cabinet, making it easy to control operation winter and summer.

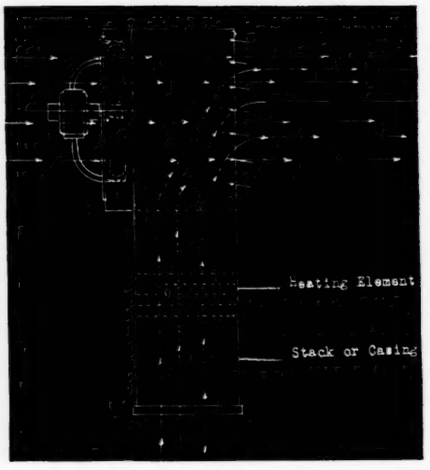
Water taps and drains may be utilized for water circulation, and house current can supply power. Cabinets are 46½ in. long, 15⅜ in. wide, and 26 in. high and contain motor, compressor, cooling coils, and fan.

Faraday Unit Heater

Alpha Tank & Sheet Metal Mfg. Co., St. Louis, is offering the Faraday induced flow unit heater, designed to accelerate diffusion of cold air with heated air. The heated air flows out of inverted V-shaped outlets and the cold air from the fan in the back flows out of the upright V-shaped outlets. These streams of hot and cold air mix after leaving the outlets and the resulting mixture of air is projected far from the face of the heater.



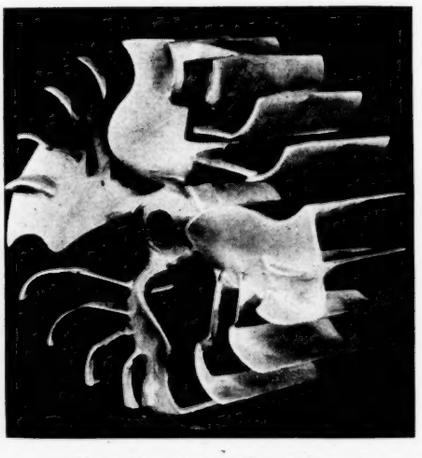
Faraday unit heater.



Diagrammatic section of Faraday unit heater.

This unit can be operated on gas, in which case gas burners are installed in place of the steam coil. When operated as a gas unit heater, the products of combustion flow out of the inverted V-shaped outlets at a high temperature.

The unit is equipped with safety controls, including an automatic safety pilot. The unit is made of welded sheet steel.



Wheel for Leinweber blower.

Leinweber Blower

The Leinweber Air Conditioning Co., 8448 Crandon Ave., Chicago, announces a new type blower cast in a single piece of aluminum alloy. It is a combination propeller and multi-blade fan construction with vanes on the tips of the blades.

According to the designer, due to the cup formation of the blades at the center, or hub portion of the wheel, a uniform suction is brought about, resulting in an even flow of air being deflected into the tips of the blades, with consequently high air volume and uniform discharge at low r.p.m. and power consumption. High efficiency is claimed in operating against static pressure.

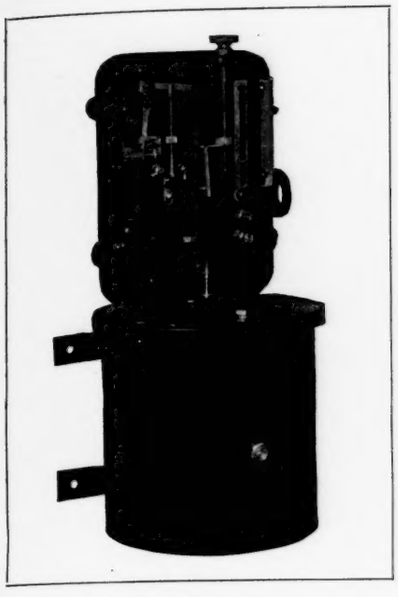
Ilg Cooling Units

Ilg Electric Ventilating Co., Chicago, has introduced the Model 11 Spot Kooler, a self-contained cooler and dehumidifier. The unit is equipped with a water-cooled compressor located in the base of an attractive grained metal cabinet. The fan and coil are located in the top of the cabinet. The circular adjustable grille provides flow of the cooled air to the right or to the left, and up or down. It is suitable for use in an office, home, small shop or restaurant. The only connections required are to the electric light circuit and water supply and return lines. It is 42¾ in. high, 29¼ in. wide, and 18½ in. deep.

This company also announced during March a ceiling type unit cooler for use in stores, restaurants and offices. The line is composed of four sizes of units ranging from one ton of cooling capacity to four tons.

Directional air control, up or down, to the right or to the left, is afforded by the circular adjustable grille. The front panel of the unit is hinged and when opened reveals the expansion valve and coil, making adjustments simple. The units are intended for use singly or in multiple with a remotely located compressor. Freon, methyl chloride, or cold water can be used as refrigerants.

Ilg Spot Kooler.



M-H static pressure control.

M-H Static Pressure Controls

Minneapolis - Honeywell Regulator Co., Minneapolis, has developed a line of static pressure regulators for applications requiring accurate control of low pressures which normally do not exceed 1 in. of water above or below atmospheric pressure. Serving in this capacity these controls find their widest use in maintaining constant static head in air distribution systems. Thus they contribute to the flexibility of the Modutrol system of which they are a part.

These controls employ an inverted bell with liquid seal as a contact actuating means. A push rod integral with the inverted bell extends upward through the top of the cast bell-and-liquid housing into the head of the control where, through a simple lever mechanism, the movement of the bell, effected by pressure variation, is transmitted to the control contacts.

They may be used as a positive or static pressure controller, as a sub-atmospheric or draft controller, or as a differential controller. These control functions determine the method of making the pressure connections to the static pressure regulator. For service in maintaining a constant positive static pressure, a single connection is made to either of the right or left hand tappings, located on the side and near the top of the bell housing, which open to the chamber above the inverted bell. Where maintenance of constant sub-atmospheric pressure is desired, connection is made to the single tapping on the bottom of the bell housing. This tapping opens to a tube which projects up through the liquid fill into the chamber under the bell. When the regulator is used as a differential or rate of flow controller, both the bottom and one of the upper tappings are used—the lesser of the two pressures is connected to the tapping on the underside of the bell housing and the greater pressure to one of the top tappings.

York Portable Air Conditioner

Portable and air cooled, so that no water connections are required, a self-contained air conditioner has been announced by York Ice Machinery Corp., York, Pa. A feature of the unit is its provision for introduction of fresh air into the conditioned space. The unit provides for cooling, dehumidifying, cleaning, and circulating.

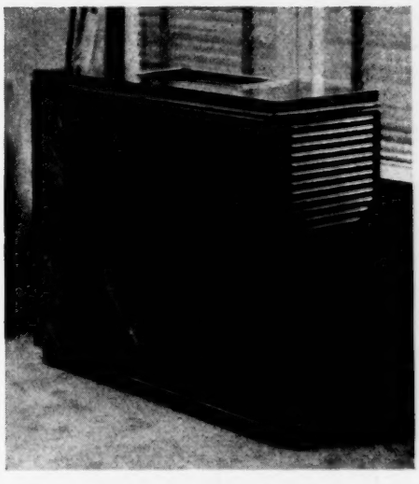
The cabinet is of walnut panels with satin chrome trim.

The conditioner is designed to be placed beside a window, and has a telescopic duct connection in the rear from which outside air is drawn for introduction into the room and for cooling the refrigerant condenser. It is mounted on rubber-tired ball-bearing casters. It is intended for single room applications.

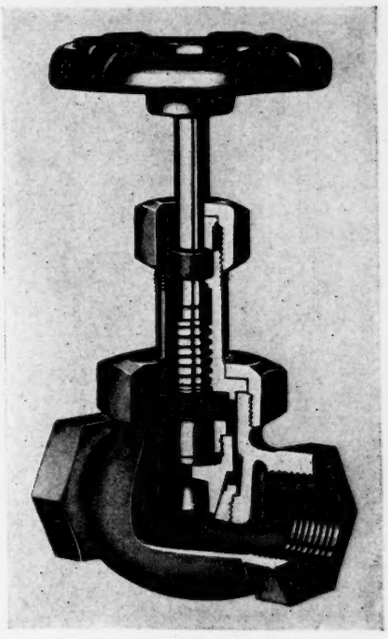
Condensed moisture from the evaporator is drained to the condenser air stream and there re-evaporated by a condensate vaporizer. To aid in liquid cooling, the receiver is mounted between condenser coils in contact with the condensate vaporizer spray.

The two-cylinder freon compressor is mounted above the motor. The compressor has a 1¾-in bore and a 1¾-in. stroke. It is driven by V-belts from a ¾-hp. motor. The conditioner has a cooling capacity of approximately ⅝ ton of refrigeration. The evaporator is a single-pass, copper fin coil. A 9-in. radial type fan circulates about 270 c.f.m., of which 25% may be outside air.

Cleanable filters are provided on fresh air intake and on recirculated air intake. The control system is easily adjustable.



Portable air conditioner.



Plug type valve.

Fairbanks Plug Type Valve

A plug type valve is being manufactured by The Fairbanks Co., New York. It is designed for service where there is excessive wire drawing or destructive action of any kind on the valve seat or disc, such as when used for drip, drain, or throttling.

The long seating surface between the plug and the seat is said to insure added life. When these surfaces become scored or cut they can be reground or renewed if necessary.

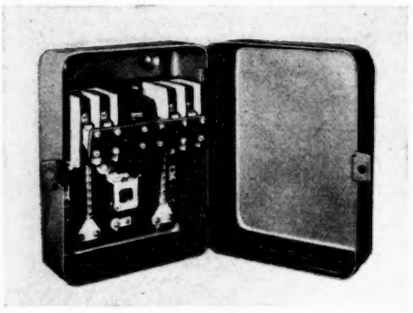
Due to the angle of the plug and seat ring sealing surfaces, the stream flow is distributed when passing between these components. It is claimed that the force of the stream cannot be concentrated on any part of the plug or seat and produce erosion or wire drawing.

The seat ring is screwed into the diaphragm. Both seat and disc are made of special nickel alloy and can be reground without removing the valve from the line.

A shoulder on the spindle affords a back seat which permits packing the stuffing box under pressure when the valve is wide open.

Dole Sodrin

The Dole Valve Co, 1901-1933 Carroll Ave., Chicago, has introduced Dole Sodrin, a boiler solder for servicing leaks in steam and hot water heating plants. It is made from a base of aluminum and contains synthetic solder which melts in hot water but hardens when cooled at the leak by air. Circulation of the water in the boiler or pipe carries the solder to the leak where it is said to build up a metallic repair.



Motor starter for across-the-line starting.

A. C. Motor Starters

Monitor Controller Co., 51 South Gay St., Baltimore, Md., has introduced an a. c. motor starter for across the line starting. These starters are intended for use with squirrel cage motors or as a primary contactor for slip-ring motors in conjunction with suitable secondary rheostats.

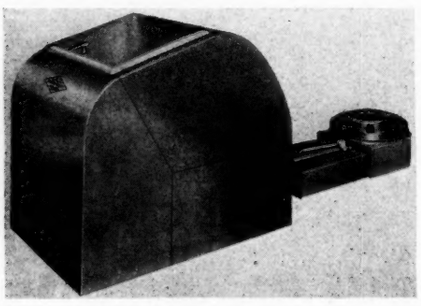
Standard features of design include: automatic reset overload; manual reset overload operative from button in cover; start and stop push button in cover; hand-off-automatic switch and reset button in cover; fusible or unfused disconnect switch.

The thermal overload relay which is an integral part of all starters is so compensated that wide variations in ambient temperatures do not affect its operating characteristics. Thus positive protection is provided under all conditions. The rating of the relay can be quickly changed by inserting the proper heater elements to handle any load condition within the range of the starter. When rating is determined, no further adjustments are necessary.

Will-Burt Stoker

The Will-Burt Co., Orrville, Ohio, has placed on the market a totally enclosed small stoker in an attractive streamlined cabinet with chromium-plated trimmings, finished in various colors to harmonize with the general scheme of basement decorations.

A feature is the automatic control of air introduced in the fire bed to complete combustion.



Will-Burt stoker.

Operation of the stokers is controlled by a room thermostat set at the desired temperature. The stoker feeds varying amounts of coal to meet outside weather changes to maintain the temperature called for by the thermostat.

Lipman Air Conditioner

General Refrigeration Sales Co., Beloit, Wis., has recently introduced the Lipman air conditioning unit suitable for retail stores, restaurants, residences, and other average size installations. This machine is made in two sizes to provide 2000 and 4000 c.f.m. of cooled air. It is built as a complete unit ready for attachment to air ducts. It automatically adjusts itself to meet varying temperature and humidity requirements.

Inland Safety Gas Controls

Inland Manufacturing Co., 1120 North Cicero Ave., Chicago, has developed a safety gas cock and adjustable external lighter which is furnished for either conversion burners or gas-designed heaters now installed and not equipped with an external means for lighting.

Its functions are to shut off gas to the appliance in the closed position, permit only the passage of gas to the pilot lighter and burner pilot in the start position, and only to the pilot and burner in the open position.

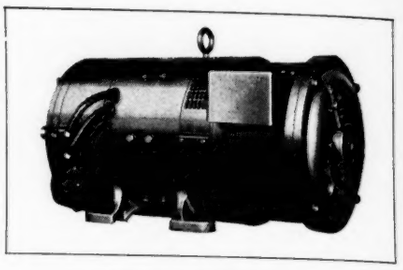
Dual Motor for Railway Air Conditioning

Century Electric Co., St. Louis, has announced a new dual motor arranged to meet the requirements for a compact compressor drive to furnish mechanical refrigeration for railway passenger car air conditioning.

This motor is two independent motors in one frame. It operates from the direct current car circuit when the train is on the road and from alternating current central station power when the car is at the terminal.

The direct current motor has characteristics suitable for operating on the coach circuit and has low starting current to keep down the battery drain. It operates satisfactorily over a considerable voltage range that is ordinarily encountered in railway service.

The alternating current end is a standard three-phase motor to be plugged into connections at the terminal. No switching is necessary to change the operation from road to terminal except to plug in the connection when the car reaches the terminal, as the equipment operates entirely automatically.



Century dual motor.

It has been designed for railway service which requires a motor light in weight and as compact as possible and yet of rugged construction. It is available in sizes from 5 to 15 hp.

Friez Humidity and Temperature Controls

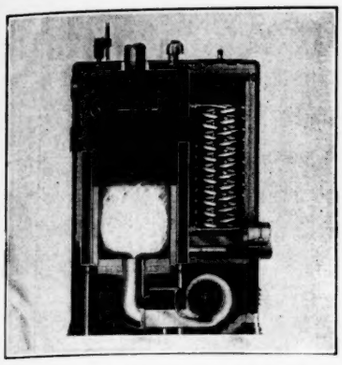
Julien P. Friez & Sons, Inc., Baltimore, Md, has developed a line of humidity and temperature controls for insertion into ducts through the walls of air conditioning cabinets, test chambers, and similar equipment. The instruments are graduated in per cent of relative humidity from 10 to 100, or in a variety of temperature ranges. They are said to be accurate to within plus or minus 1% relative humidity or plus or minus ½°.

This company also placed on the market a line of humidity controls having especially prepared multiple human hair elements. They are furnished in alumilite cases. The setting is by bakelite knob and rotating dial.

Other new equipment includes a line of thermostats said to be sensitive to temperature changes as low as plus or minus ½°. Summer-winter manual switches are built into the instrument case and interwired so that all types of heating and cooling equipment can be operated off a single instrument during both summer and winter.

Changing the position of the summer-winter switch reverses the action of the electrical contacting within the instrument so that heating equipment is started on falling temperature in the winter, whereas cooling equipment is started on rising temperature in the summer.

Insertion type control.



Scott-Newcomb oil-burning heater.

S-N Oil Furnace

Scott-Newcomb, Inc., 1922 Pine St., St. Louis, has introduced the S-N oil furnace, in which a gas burner can be substituted if gas heat is desired. The unit has a vertical flame burner available in two different types, one a pressure atomizing and the other a low pressure air atomizing. Nos. 3 and 4 oils are used.

The boiler proper is made of copper-bearing steel, electrically welded. The economizer consists of copper coils. The combustion chamber is enclosed by molded firebrick. The products of combustion pass upward, and then downward, and leave the stack at the coolest point in the economizer section.

The boilers are insulated with air cell insulation. A hot water copper coil is located on one side of the boiler, and is removable. The case is finished in two tones of green with a black trim. Three sizes are available—500, 1000, and 1500 sq. ft. of steam radiator or equivalent.

Super-Silvertop Trap

The V. D. Anderson Co., 1935 West 96th St., Cleveland, recently announced the Super-Silvertop, an inverted bucket steam trap. A feature is that no pipe fittings are necessary to install the trap in the steam line. Both the inlet connections are at right angles to the trap, which permits the trap itself to be used as an elbow or straight in the line.

The trap can be inspected and cleaned without disturbing the pipe connections by removing the bolts and taking off the bottom section. The manufacturer claims that parts can be renewed in 3 min.

Other features include a design which permits keeping the parts in proper alignment, and reverse flow which allows no impingement of condensate on the bucket.

The working parts of the trap are made of heat-treated stainless steel. the valve and seats are made of a tough, chrome alloy.

The device is available in five sizes with capacities ranging from 285 to 3300 lb. of water per hr. at 2 lb. steam pressure, and from 600 to 7500 lb. per hr. at 50 lb. pressure. The maximum gauge pressures range from 150 to 250 lb., depending on the size trap.

Stevens-Root Hot Water Pump

The Stevens-Root Co., 51 East Grand Ave., Chicago, announces a hot water circulating pump for use with its force-flo one pipe system of hot water heating. This pump employs a water seal which replaces the stuffing box formerly used and which is said to be capable of operating against high pressures without leakage. Another feature is the forged impeller which, combined with reduced friction made possible by the seal, gives greater capacities at higher heads than formerly obtained. It is made in five sizes from ¾ to 3 in., the largest size delivering 100 g.p.m. at 5½ ft. of friction head.

This company also announces the development of control valves for checking hot water circulation, indirect heaters, and other specialties which are combined into a complete system of space and domestic water heating for summer-winter operation from the same boiler.

Worthington Monobloc Centrifugal Pumps

Worthington Pump and Machinery Corp., Harrison, N. J., has added two larger units to its Monobloc centrifugal pump group. They are designed for use in connection with air conditioning, water heaters, refrigeration, laundries, boiler return systems, industrial plants, and similar applications. The new pumps, of sizes 3 in. and 4 in., are essentially similar in design to the original smaller units of the line, and considerably extend the range and capacities of the group.

This pump, besides being rigidly mounted on the motor frame, is supported by a foot resting on the base. The pump impeller is mounted directly on the motor shaft and both pump and motor are bolted to one base, thus relieving the pump from pipe strain. Additional improvements are in impeller design, renewable wearing rings, and balance rings that eliminate end-thrust and put the stuffing box under suction pressure only, thus increasing the efficiency and active life of the unit.

G. E. Thyratron Motor

An electric motor which utilizes a stationary commutator and has the characteristics of a series-type d.c. machine but which operates from an a.c. power source, has been developed by General Electric Co., Schenectady, N. Y. Known as a Thyratron motor, the new motor is made possible by recent advances in the application of electron tubes.

Among the features of this motor are the following:

(1) While running from alternating current, the motor has the characteristics of a series-type direct-current machine.

(2) Motor speed is independent of the frequency of the power supply.

(3) Smooth control of speed can be obtained over the full range.

(4) In event of a momentary interruption of the supply circuit, the motor will, upon restoration of power, start and return to the speed at which it was previously operating, without drawing excessive current from the line.

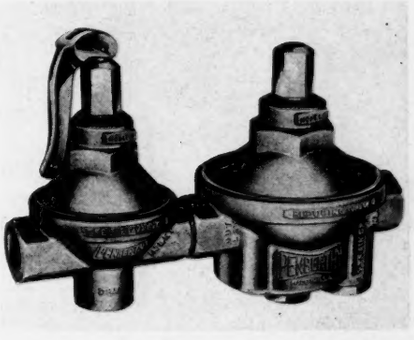
(5) Efficiency is high and the efficiency curve relatively flat—an advantage in the lower portion of the speed range.

Because of these characteristics, motors of this type are applicable to such auxiliaries as fans, centrifugal pumps, compressors, and similar equipment having load characteristics such that the series type of motor can be used to advantage.

Penberthy Pressure and Relief Controls

Penberthy Injector Co., Detroit, Mich., has placed on the market a line of pressure and relief controls for hot water heating systems. Model A, which consists of both a reducing valve and relief valve, automatically keeps the hot water heating system filled with water and relieves excess pressure. It is made of steam bronze with large laminated phosphorus bronze diaphragms which are resistant to heat and corrosion. Gaskets above and below the diaphragms and relieved casting corners prevent binding. The only spring exposed to water is the one below the seat in the reducing valve.

Model B is a similar model except that it is of somewhat smaller capacity. The relief valve is also available in two models separately, Model 1 being a ½ in. unit, and Model 2 a ¾-in. size.



Model A pressure and relief control.

Robeson Air Conditioning Systems

Robeson Engineering Co., Inc., 212 So. Burnet St., East Orange, N. J., is marketing a line of warm-air type air conditioning furnaces available in two types, designated as standard and junior. In the standard system the furnaces are made of boiler plate steel, 10 and 12 gauge. Inside the casing are throw-away spun glass or wire wool filters, and a centrifugal blower driven by a split-phase or capacitator motor. It is equipped with a humidifier, economizer, and hot water heater and the casing is of asbestos board finished in grey and black.

The junior system is designed for small homes. This unit has a blower washer as a separate but attached part. It has a capacity of 110,000 to 125,000 B.t.u. per hr., depending on the size. The standard size is available in six sizes with capacities ranging from 125,000 to 400,000 B.t.u. per hr.

A split steam system is also available with extended surface coils which can be connected to the boiler, the supplementary conditioning unit containing the filters and blower. It is available in six sizes with capacities ranging from 125,000 to 400,000 B.t.u. per hr.

Gorton No. 2 Air Eliminator

Gorton Heating Corp., Cranford, N. J., has announced the No. 2 Gorton air eliminator, an addition to the company's Surevent equalizing system. This eliminator was developed to meet the demands for an eliminator to quickly vent steam mains in apartment and other large buildings. It is 4 in. in diameter, 7 in. high, with ½ in. vertical connection. Its air outlet is four times greater than that of the No. 1 eliminator. The operating member is made of a non-corrosive thermo-metal that is sensitive to heat changes.

When steam or vapor enters the eliminator the heat causes the thermo-metal to expand and close the eliminator and holds it closed as long as there is any steam in the main. The eliminator has an open float which will close it against a slug of water. It can be used on one or two-pipe steam or vapor heating systems.

Inland Unit Heater Hanger

Inland Manufacturing Co., 1120 North Cicero Ave., Chicago, has introduced the Inland unit heater hanger and canopy, designed to support and fit all sizes of gas unit heaters.

The hanger consists of two separate frames made up of 1½ x 1½ x 3/16 in. channel irons. The upper or ceiling frame is fastened to ceiling joists with two hook bolts. The lower or unit heater frame is supported by a single ½-in. machine bolt from the upper frame which permits rotating of unit heater to any angle on a horizontal plane. This angle may be changed while the unit heater is in place.

The canopy is an aluminum finished 24-gauge metal cover for use in spaces where it is desirable to completely conceal hangers, giving a finished appearance to the whole installation. It is supported entirely by the lower frame of hanger with locknuts and a draw-bar which holds the canopy to the ceiling.

Hobart Arc Welders

Several features are incorporated in the model HF, gasoline-engine-driven arc welders announced by The Hobart Brothers Co., Troy, Ohio.

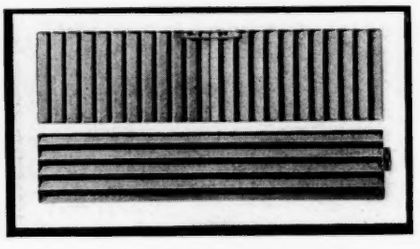
Startix equipment with automatic choke and downdraft carbureter is provided. The Startix goes into operation as soon as the ignition switch is turned on and automatically cuts out when the engine starts.

The 200 and 300 ampere sizes are equipped with 6-cylinder engine, while the 400 ampere size is equipped with a heavy duty, 8-cylinder industrial engine. Variable speed adjustment makes it possible for the operator to select the most economical engine speed for each job, at any point from 1000 to 1800 r.p.m., full rated capacity being available at 1500 r.p.m.

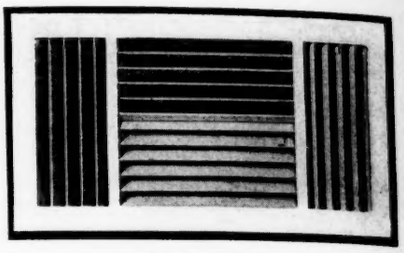
All models may be had in stationary form or portable, with shop type or yard type steel wheels, or mounted on a road trailer with wire wheels, pneumatic tires, radius rods and stabilizer.

Waterloo Directional Flow Registers

The Waterloo Register Co., East 4th St., Waterloo, Iowa, has announced two new types of directional flow air conditioning registers. Model F-530, designated as a Down-Flo Diffuser, has two sets of vertical multiple louvers set in the upper half section operating independently to give an adjustable control over air spread to right and left. A single set of horizontal louvers in the lower half section turn downward 90° from full open to throw part of the air flow down. Three locks



F 530 register.



F 540 register.

are said to assure positive control.

Model F-540, designated as the Quadri-Flo Diffuser, is for ceiling and wall use and has four independent sets of louvers under lock control sending air right, left, up and down at the same time. When full open the louvers give a straight air flow.

Elgin Isometer

A flow meter which utilizes a varying orifice is being manufactured and marketed by the Elgin Softener Corp., Elgin, Ill. As the flow of steam, water, oil, or other liquid or gas varies, the orifice opens and closes. A constant pressure drop is maintained by changing the orifice opening. The flow is then accurately determined by measuring the amount of orifice opening at any instant.

It is claimed that the varying orifice principle of operation makes it possible to measure low rates of flow accurately down to as low as 2½% of the meter capacity. It is also said that pulsating flows can be more accurately measured. Errors due to friction are also eliminated, it is claimed, because the power of the actuator is far in excess of that actually required to move the orifice gate and the metering units are electrically driven.

The complete device consists of two parts — the actuator and the meter unit.

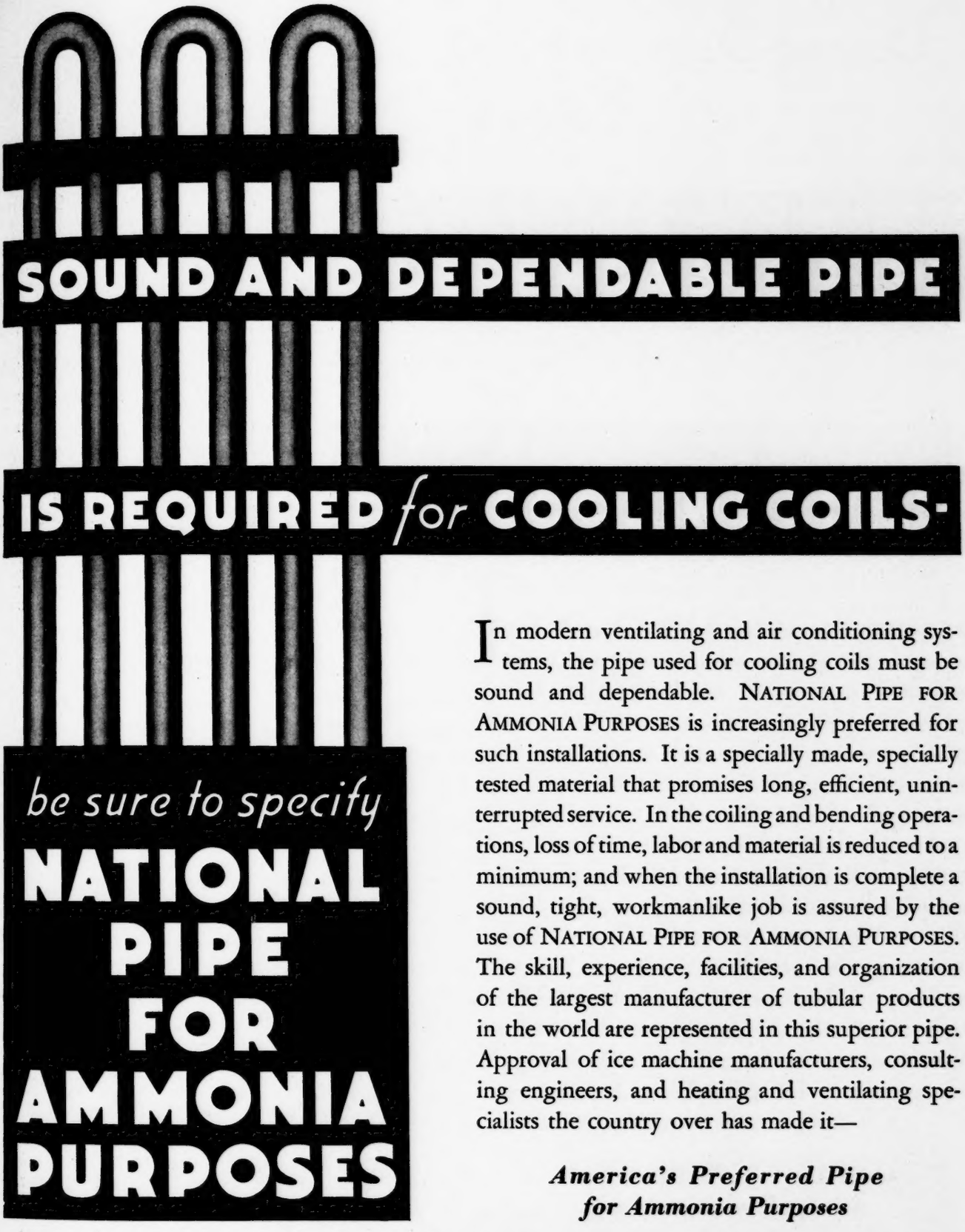
Air Pollution Described at A. C. Bureau Meeting

(Concluded from page 50)

They have a practical and economical solution to the problem of cleaning large volumes of air, but first cost precludes their use on small installations of less than 5,000 c.f.m., except in special cases."

E. D. Johnson, Buffalo Forge Company, was the next speaker, and described in detail various types of air washers and filters, including spray, unit and humidifier types, the centrifugal, gas scrubbers and those used in the glass and rubber industries, where the slightest impurity would ruin a batch of the product.

Richard Brunel, consulting engineer for William Filene's Sons Company, described the new air conditioning system in the Filene store.



In modern ventilating and air conditioning systems, the pipe used for cooling coils must be sound and dependable. NATIONAL PIPE FOR AMMONIA PURPOSES is increasingly preferred for such installations. It is a specially made, specially tested material that promises long, efficient, uninterrupted service. In the coiling and bending operations, loss of time, labor and material is reduced to a minimum; and when the installation is complete a sound, tight, workmanlike job is assured by the use of NATIONAL PIPE FOR AMMONIA PURPOSES. The skill, experience, facilities, and organization of the largest manufacturer of tubular products in the world are represented in this superior pipe. Approval of ice machine manufacturers, consulting engineers, and heating and ventilating specialists the country over has made it—

America's Preferred Pipe for Ammonia Purposes

NATIONAL TUBE COMPANY – Pittsburgh, Pa.

Pacific Coast Distributors—COLUMBIA STEEL COMPANY, San Francisco, Calif. *Export Distributors*—UNITED STATES STEEL PRODUCTS CO., New York, N. Y.

United States Steel Corporation Subsidiary

Degree-Days and Unit Fuel Consumption—February, 1935

Continuing HEATING AND VENTILATING's seventh year of publishing degree-day data for various large cities in the United States

	Atlanta	Baltimore	Birmingham	Boston	Buffalo	Chicago	Cincinnati	Cleveland
Degree-days for February, 1935	561	838	476	1040	1155	988	836	1019
Degree-days, Sept. 1, 1934 to Feb. 28, '35	2343	3355	1994	4582	4781	4362	3561	4136
Degree-days, Sept. 1, 1933 to Feb. 28, '34	2212	3611	1776	4853	5296	4475	3835	4482
Degree-days, Sept. 1 to Feb. 28, Normal	2370	3462	2079	3280	4767	4582	3666	4440
Lb. coal per sq. ft. rad., February, 1935.	4.488	6.704	3.808	8.320	9.240	7.904	6.688	8.152
Gal. oil per sq. ft. rad., February, 1935.	0.385	0.575	0.326	0.713	0.792	0.677	0.573	0.699
Cu. ft. gas per sq. ft. rad., February, '35	53.86	80.45	45.70	99.84	110.88	94.85	80.26	97.82

	Denver	Des Moines	Detroit	Duluth	El Paso	Fort Wayne	Grand Rapids	Harrisburg
Degree-days for February, 1935	754	963	1136	1266	462	1022	1104	968
Degree-days, Sept. 1, 1934 to Feb. 28, '35	3478	4626	4233	6644	1782	4415	4658	3999
Degree-days, Sept. 1, 1933 to Feb. 28, '34	3078	4575	4907	7013	1677	4681	5011	4324
Degree-days, Sept. 1 to Feb. 28, Normal	4273	4935	4719	6634	2101	4512	4863	4077
Lb. coal per sq. ft. rad., February, 1935.	6.032	7.704	9.088	10.128	3.696	8.176	8.832	7.744
Gal. oil per sq. ft. rad., February, 1935.	0.517	0.660	0.779	0.868	0.317	0.701	0.757	0.664
Cu. ft. gas per sq. ft. rad., February, '35	72.38	92.45	109.06	121.54	44.35	98.11	105.98	92.93

	Hartford	Indianapolis	Kansas City	La Crosse	Los Angeles	Louisville	Memphis	Milwaukee
Degree-days for February, 1935	1043	896	789	1123	168	750	556	1077
Degree-days, Sept. 1, 1934 to Feb. 28, '35	4500	3850	3591	5446	723	3168	2271	4859
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4922	4108	3383	5411	728	3378	2272	4912
Degree-days, Sept. 1 to Feb. 28, Normal	4416	4099	4216	5579	1016	3327	2470	5185
Lb. coal per sq. ft. rad., February, 1935.	8.344	7.168	6.312	8.984	1 344	6.000	4.448	8.616
Gal. oil per sq. ft. rad., February, 1935.	0.715	0.614	0.541	0.770	0.115	0.514	0.381	0.738
Cu. ft. gas per sq. ft. rad., February, '35	100.13	86.02	75.74	107.81	16.13	72.00	53.38	103.39

	Minneapolis	New Haven	New Orleans	New York	Oklahoma City	Omaha	Peoria	Philadelphia
Degree-days for February, 1935	1105	1004	209	935	592	874	941	893
Degree-days, Sept. 1, 1934 to Feb. 28, '35	5718	4263	876	3893	2488	4293	4279	3568
Degree-days, Sept. 1, 1933 to Feb. 28, '34	5788	4651	690	4230	2466	4192	4390	3809
Degree-days, Sept. 1 to Feb. 28, Normal	5950	4230	965	3870	2986	4765	4673	3629
Lb. coal per sq. ft. rad., February, 1935.	8.840	8.032	1.672	7.480	4.736	6.992	7.528	7.144
Gal. oil per sq. ft. rad., February, 1935.	0.758	0.688	0.143	0.641	0.406	0.599	0.645	0.612
Cu. ft. gas per sq. ft. rad., February, '35	106.08	96.38	20.06	89.76	56.83	83.90	90.34	85.73

	Pittsburgh	Portland, Ore.	Providence	Reading	Rochester	St. Louis	Salt Lake City	San Francisco
Degree-days for February, 1935	889	527	1016	945	1135	739	774	305
Degree-days, Sept. 1, 1934 to Feb. 28, '35	3816	2734	4437	3934	4765	3294	3773	1522
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4291	2537	4784	4178	5260	3384	3229	1532
Degree-days, Sept 1 to Feb. 28, Normal	3947	3174	4315	4082	4825	3652	4144	1770
Lb. coal per sq. ft. rad., February, 1935.	7 112	4.216	8.128	7.560	9.080	5.912	6.192	2.440
Gal. oil per sq. ft. rad., February, 1935.	0.610	0.361	0.697	0 648	0.778	0.507	0.531	0.209
Cu. ft. gas per sq. ft. rad., February, '35	85.34	50.59	97.54	90.72	108.96	70.94	74 30	29.28

	Scranton	Seattle	Spokane	Syracuse	Toledo	Trenton	Washington, D. C.	Wichita
Degree-days for February, 1935	1044	562	822	1131	1061	959	828	717
Degree-days, Sept. 1, 1934 to Feb. 28, '35	4517	2875	4190	4827	4449	3960	3411	3211
Degree-days, Sept. 1, 1933 to Feb. 28, '34	4946	2789	3854	5331	4747	4349	3640	3030
Degree-days, Sept. 1 to Feb. 28, Normal	4552	3309	4707	4980	4465	3715	3559	3773
Lb. coal per sq. ft. rad., February, 1935.	8 352	4.496	6.576	9.048	8.488	7.672	6.624	5.736
Gal. oil per sq. ft. rad., February, 1935.	0.716	0 385	0.564	0.776	0.728	0.658	0.568	0.492
Cu. ft. gas per sq. ft. rad., February, '35	100.22	53.95	78.91	108.58	101.86	92.06	79.49	68.83

Fuel consumption figures given above are based on certain conditions, and for other conditions corrections must be made. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr., a system operating at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal, 1000 B.t.u. per cu. ft. for gas, and 140,000 B.t.u. per gal. for oil. To correct for other heating values, efficiencies, and design conditions, follow the method explained in the "Heating and Ventilating Degree-Day Handbook."

Kentucky's finest School...

J. Meyrick Colley, School Board Architect; George H. Rommel, Louisville, Ky., Stearnes Company, Chicago, Ill., and Chagnard Plumbing & Heating Co., Louisville, Ky., Contractors.

equipped with *TONCAN IRON PIPE*

One of the finest school buildings in the State of Kentucky, the Louisville Girls' High School, is equipped with black and galvanized Toncan Iron Pipe for water and steam lines in the cafeteria. This building, with equipment, cost almost a million dollars and is typical of the fine character of the buildings in which this better pipe is being installed. • Toncan Iron is recognized by owners, architects, engineers and contractors as a forward step in the fight against rust. For twenty-five years it has been saving money for building owners by cutting down replacements. • It is an alloy of refined open hearth iron, copper and molybdenum. It possesses the highest rust-resistance of any ferrous metal in its price class. In the form of pipe, it cuts, bends, threads and welds with no more difficulty than non-alloy pipe. Naturally, it costs a little more, but the increase in cost is far less than the savings it makes through its longer life in service. • Read "Pipe for Permanence" and find out why Toncan Iron Pipe is coming into almost universal use for new work and for replacements. Copy on request.

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TONCAN
COPPER
MO-LYB-DEN-UM
IRON PIPE

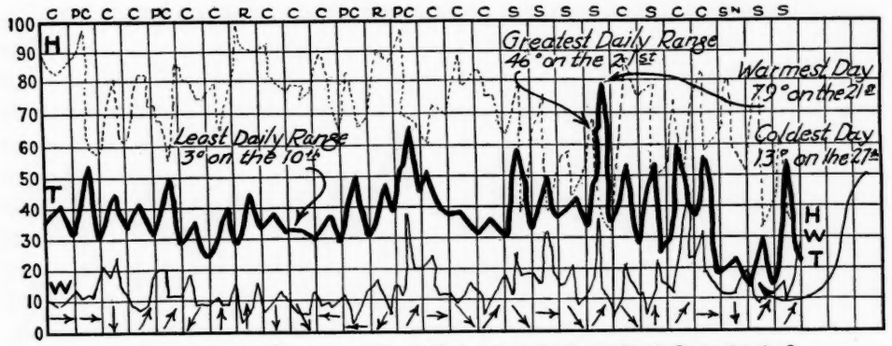
Republic Steel

CORPORATION

GENERAL OFFICES · · · YOUNGSTOWN, OHIO

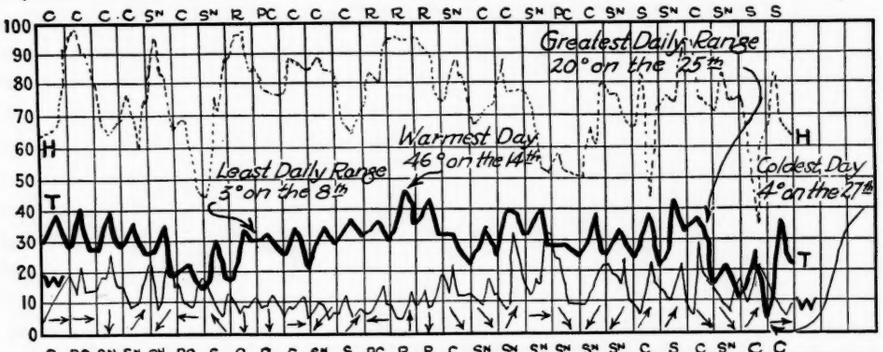
THE WEATHER FOR FEBRUARY, 1935

Plotted from records especially compiled for HEATING AND VENTILATING by the U. S. Weather Bureau. Heavy curves (T), temperatures in deg. F.; dotted lines (H), per cent relative humidity, from readings at 8 a.m., noon, and 8 p.m., except for New York, which shows hourly readings. Light lines (W), wind velocity in m.p.h. Arrows indicate prevailing wind directions. S—clear; PC—partly cloudy; C—cloudy; R—rain, Sn—snow.



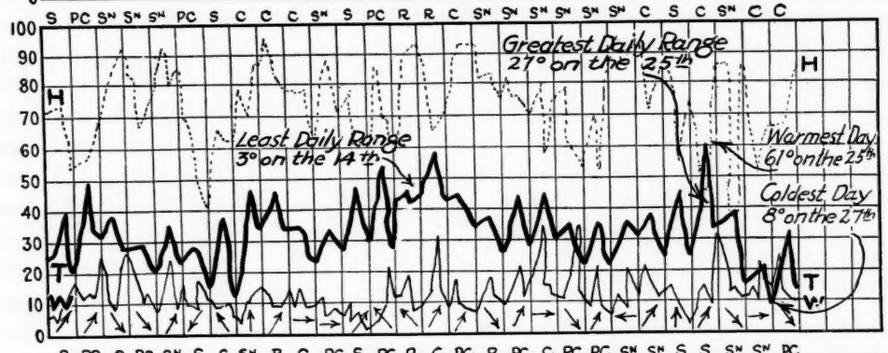
St. Louis

Mean temp. for month, 38.5°; aver. wind velocity, 12.7 m.p.h.; prevailing direction of wind, N.W.



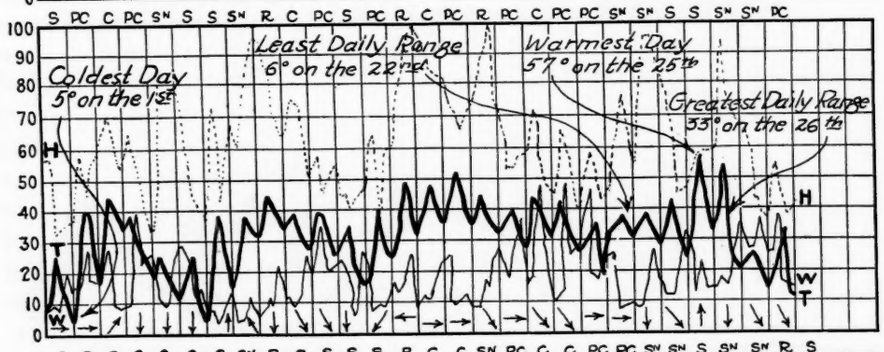
Chicago

Mean temp. for month, 29.6°; aver. wind velocity, 11.2 m.p.h.; prevailing direction of wind, S.W.



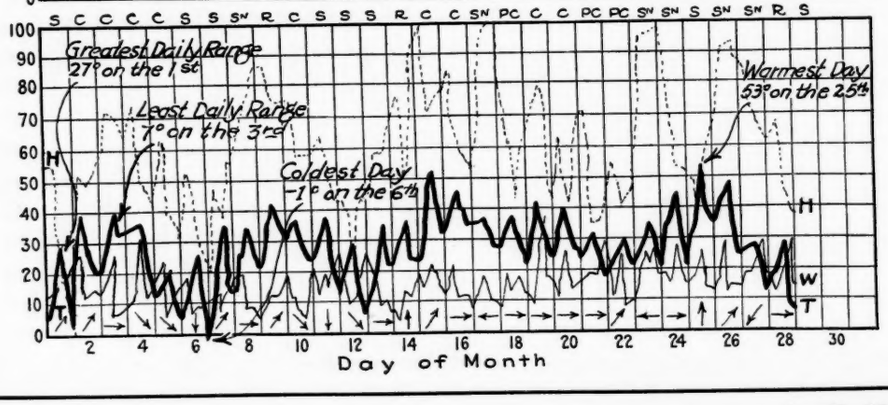
Pittsburgh

Mean temp. for month, 33.2°; aver. wind velocity, 11.2 m.p.h.; prevailing direction of wind, S.W.



New York

Mean temp. for month, 31.6°; aver. wind velocity, 15.3 m.p.h.; prevailing direction of wind, N.W.


Greatest Daily Range
27° on the 1st
Least Daily Range
7° on the 3rd
Coldest Day
-1° on the 6th
Warmest Day
53° on the 25th
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Boston

Mean temp. for month, 27.8°; aver. wind velocity, 14.4 m.p.h.; prevailing direction of wind, W.

Headquarters FOR Heating, Ventilating AND OTHER AIR EQUIPMENT

SEND FOR THIS UP-TO-THE-MINUTE DATA

1. Silentvane Fan

Backwardly curved blade type. A ventilating fan to meet the most exacting specifications, where very high efficiency and exceptionally low power consumption are required.

2. Multivane Fan

Forwardly curved blade type. A highly efficient centrifugal ventilating fan of sturdy construction to meet the general run of ventilating requirements.

3. Rexvane Fan

The modern paddle wheel. Correct inlet blade curvature and streamline shrouding retains all good features of the old paddle wheel and greatly increases capacity.

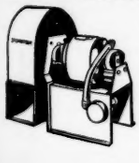
4. Convertible Multivane Fan

This is a low speed centrifugal type fan with convertible and reversible housing, permitting quick conversion to any horizontal or vertical discharge.

5. Air Washer

Built in several types to meet varying requirements in cleaning, cooling, dehumidifying and humidifying air.

6. Ventilating Sets

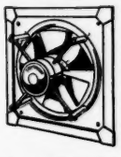


For use with ducts, in ventilating small rooms, laboratory hoods, and in general any room up to 10,000 cubic feet contents.

7. Unit Ventilator

A combined steam-heating and ventilating unit widely used in schools and other places. Finished in Duco of any standard color. Stainless steel trim.

8. Propeller Fan



Built in fan sizes from 12" up to 45". Electric motors are available for both A.C. and D.C. current, in wide variety of voltages.

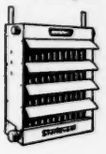
9. Filticooler

A compact, high-efficiency air washer. For filtering, washing, humidifying, cooling, and dehumidifying. Used principally for public buildings and factories. Available in range of sizes.

10. Humidifilter

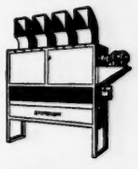
A humidifying and filtering unit primarily adapted to central systems. Used for both comfort and industrial processing work. Available in range of sizes.

11. Suspended Speed Heater



Wall or ceiling installation. Fin type heating element. For all steam pressures up to 200 lbs. Capacities up to 636,000 B.T.U.

12. Rexvane Speed Heater



Floor, wall, or ceiling installation. Fin type heating element. For steam pressures up to 200 lbs. Capacities up to 1,000,000 B.T.U.

13. Coal Burning Blower

A small, compact forced draft fan for coal burning heaters in residences, apartment houses, schools, commercial and industrial establishments.

B. F. STURTEVANT COMPANY

Main Offices: Hyde Park, Boston, Mass.

Chicago, Ill., 400 N. Michigan Ave.; San Francisco, Cal., 681 Market St. *Branch Offices in Other Cities*

B. F. STURTEVANT CO. of CANADA, Ltd., GALT. Sales Offices in Toronto and Montreal

Representatives in Principal Canadian Cities

Sturtevant

USE THIS COUPON

B. F. Sturtevant Company, Hyde Park, Boston, Mass.

☐ Please send me information regarding the following Sturtevant Equipment. (Refer to by number) .....

☐ Please have your representative call. H.V.-4/35

Name..... *Company*.....

Address.....

WORLD'S LARGEST MAKER OF HEATING, VENTILATING AND ALLIED AIR EQUIPMENT

Background facts that give ASSURANCE to the buyer of Badger Expansion Joints

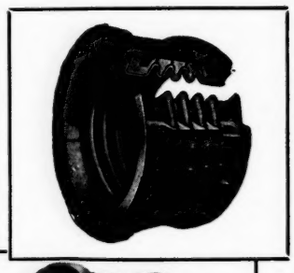
Thousands of Installations

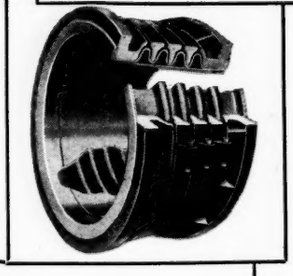
There is a very good reason why today there are thousands of Badger Self-Equalizing Expansion Joints in service and why users place repeat orders consistently. It is because these joints are designed correctly, made correctly and applied correctly. Back of them is an experience covering 40 years.

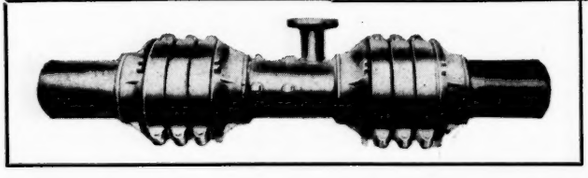
No chances ever should be taken in a piece of apparatus such as an expansion joint. It's a safety factor, a preventive of trouble. It protects the steam, liquid or gas line. Realizing this, you will place your faith in the joints that have proved their worthiness. The thousands of Badger Expansion Joints in service today bear witness to their dependability.

. . .

Badger Self-Equalizing Expansion Joints, both flanged and welding end, are made with the Directed Flexing feature. This feature, exclusive with joints made by E. B. Badger of Boston, means much longer life in that the flexing is progressively controlled as well as limited and stresses are distributed. These joints do not require any attention or maintenance. They avoid steam losses. Standard sizes range from 3" to 24".







E. B. BADGER & SONS CO.

75 PITTS ST., BOSTON, MASS.
271 MADISON AVE., NEW YORK, N. Y.

AGENTS IN PRINCIPAL CITIES

BADGER EXPANSION JOINTS

Notes on Forced Warm-Air Heating Layouts

(Concluded from page 22)

bows with a radius of 1½ pipe diameters are preferred wherever changes in direction of pipes and ducts occur. All warm-air pipe connections to risers should be made with free flowing transition fittings.

Locking type dampers with a dial or quadrant indicator are recommended for installation in each warm-air pipe or duct attaching to the unit and for each branch off the main ducts. The dampers should be placed in each branch as close to the furnace top or main duct as practicable. Locking-type dampers should be placed in each branch of the return-air system.

Zone Control

For residences other than the square or compact type we believe zone control is the answer to better and more uniform heating. We all know that the weather conditions are constantly changing; one day the wind is from this direction, tomorrow it is from another direction; on another day the outside conditions are quiet and but very little, if any, air moving. All of these varying wind conditions must be considered in determining how to heat the building.

In a zone control job, one should zone for rooms having similar exposures and not zone for room characteristics. To illustrate: compare the recreation room in the basement, the living room on first floor and a bedroom, dressing room, and bath on the second floor. If one should zone for rooms of like character such as for all bedrooms, there might be instances where each bedroom would have exposures different from another and the heating condition would not be uniform. If a garage is to be heated from the unit it should be on a separate zone. Rooms above porches and garages should be zoned independent of other rooms.

A Method of Burning Anthracite Screenings in Residential Boilers

(Concluded from page 27)

rials in this manner. Instead of such material retarding or hindering the burning of the coal, it is an aid to rapid combustion, particularly if the waste material is deposited on the fuel bed before fresh fuel is added.

Contrary to the usual expectations, such a fire is not slow burning. It is, on the other hand, marvelously quick. The greater proportion of the heat is generated in the form of burning gas issuing from the surface of the green fuel bed. This gas issues in burnable form almost immediately after firing. In fact, it frequently generates so rapidly that the pressure control on the boiler will stop the blower within two or three minutes after throwing on the last shovel of coal. It is quite essential to keep the fuel in a wet condition, as it not only keeps the fuel dustless, but also greatly accelerates the generation of the gas.

One soon finds that the splendid control of heat and

the ease with which ash can be removed through this method of operating provide the main essentials sought in a comfortable and convenient system of heating.

FHA Bill to Insure Loans for Commercial Modernizing Approved by House

(Concluded from page 28)

In order to stimulate activity with respect to mortgages on dwellings to be insured under the National Housing Act, and to assist borrowers to more readily contact willing lenders, Federal Housing Administrator Moffett announced March 21 that in addition to the regular procedure, borrowers may now also apply directly to the Administration through any of its insuring offices for appraisal of property, approval of credit responsibility of the borrower, and determination of the eligibility of the mortgagee for insurance.

This additional facility means that a prospective borrower, whether on new construction or for refunding an existing mortgage, may present his application for a loan with any of the insuring offices of the Administration. Any informal commitment to insure the mortgage when executed will be issued by the Administration if, upon examination of the application, appraisal of the property or of the plans and specifications, and the credit examination of the borrower's responsibility, the mortgage is deemed insurable.

The prospective borrower, in this event, would then proceed with the assistance of the Administration, if necessary, to find a financial institution which had qualified as an approved mortgagee and was willing to make the loan.

Code Activities Quiet As Future of NRA Remains Doubtful

(Concluded from page 44)

have been sent out should be returned; returned even if there is no work to report. The fact that there is no work is as valuable in making a plea for the further rehabilitation of the industry as other figures.

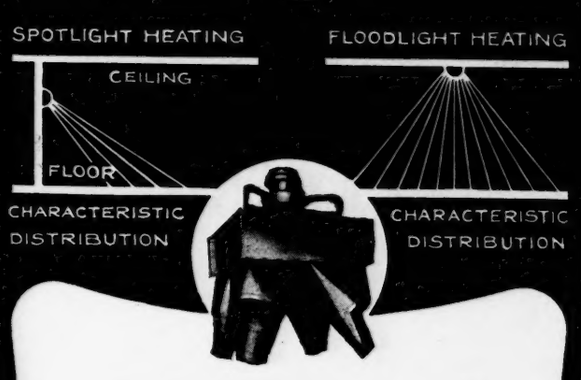
The work of summarizing the results, however, for which there is a pressing need, cannot be started until the returns are complete and the actual condition of the industry cannot be reported to those who have the responsibility of guiding the policies of the industry without the immediate active cooperation of every member.

Administrative orders have been issued by NRA approving the lists of hazardous occupations from which minors shall be excluded in the warm-air register and cast-iron boiler and cast-iron radiator industries.

NRA has announced its recognition of the 8 members (and 8 alternates) of the code authority of the valve and valve fittings manufacturing industry.

At a recent hearing held in Washington relating to the code of the pump manufacturing industry, testimony was taken to show that the sponsors of this code are not truly representative of the industry. This con-

Heat Your Building by THE *Floodlight* PRINCIPLE



In olden days we lighted a shop by placing an individual light over each machine (spot lighting as it were).

Modernization brought about the efficient and economical Flood Lights of the present day.

Along similar lines has developed the heater—the

WING FEATHERWEIGHT UNIT HEATER

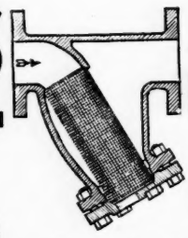
offering this exclusive feature "a floodlight of heat."

Located in the ceiling, out of the way, it takes the air at the top of the building (preventing an accumulation of unprofitable heat) and forces it down to the floor area, through a number of perfectly distributed outlets, thereby covering completely the entire area to be heated.

Write for our latest Bulletin "Modern Heating A Plant."

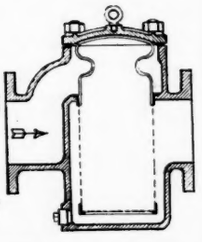
L. J. WING MFG. CO.
158 W. 14th St., New York City
AND ELSEWHERE

STRAINERS



For All Purposes

Stock Shipments



Pipe scale, boiler scale, joint compound and other foreign matter can often be the cause of much damage to automatic equipment. Unduly rapid wear, unsatisfactory operation, or complete failure can frequently be attributed to pipe line impurities.

To avoid such difficulties, experienced engineers are now making it a practice to install strainers wherever possible. Strainers afford desirable protection to pressure regulators, steam traps, meters, valves, pumps, turbines—all equipment with internal moving parts.

Considering the moderate cost of Davis Strainers, their use is one of the most profitable equipment investments that can be made.

The Davis Basket Type Strainer is used extensively on suction and pressure pipe lines carrying water, oil and other fluids. Being without moving parts, it functions in a thoroughly reliable manner. The only possible maintenance cost is screen cleaning.

In the Davis Strainer, the basket is greater in diameter than the corresponding pipe size. The body passages and the screen have excess area. This gives an absolute minimum pressure drop.

Send for Bulletin 100.

Automatic Valve Specialists

DAVIS REGULATOR COMPANY

2553 S. WASHTENAW AVE., CHICAGO, ILL.

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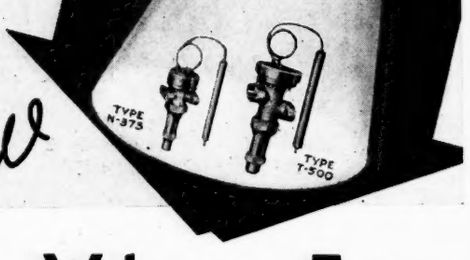
TWO *New*



Thermo Valves for Freon

NOW you can get two new valves for automatic control of liquid Freon. New in every respect. Appearance. Construction. Precision. Sensitivity. Size. Weight. Capacity. In process of development and testing for over a year.

Absolutely dependable for automatically increasing or decreasing the flow of liquid Freon to any low side evaporator according to load variations occurring at any time. Actuated only by superheat of refrigerant leaving evaporator, they respond at once to load changes. They maintain any desired temperature in any "low side" regardless of how many similarly equipped low sides may be operated by one compressor. *Power assembly guaranteed two years against failure. It cannot lose charge except through actual injury.*

WRITE FOR BULLETIN TODAY

TYPE N-375 for any specified capacity up to 5 tons of Freon.

TYPE T-500 for any specified capacity from 5 to 11 tons of Freon.

(Present TYPES KR and FR now equipped with "two years" power assemblies—interchangeable with assemblies on all similar valves now in use.)

ALCO VALVE CO., INC., 2624 Big Bend Blvd.
ST. LOUIS, MO., U. S. A.

"Known Wherever Temperature is Controlled"

ALCO VALVES

tention was disputed by the sponsors. NRA has not yet rendered a decision in the matter.

The warm-air furnace manufacturing industry has submitted a proposed amendment to Article I of its code, as follows:

"(a) The Industry means and includes the business of manufacturing and selling by manufacturers of cast-iron and steel warm-air heating furnaces and/or parts thereof used in the assembly of new furnaces in the United States."

The deadline date for objections to the amendment proposed was set by the NRA board for March 18. The matter is now before the NRA advisory boards for review.

NEW CATALOGS

(Unless otherwise indicated, the publishers of catalogs will supply copies on request without charge)

Air Conditioning Utilities, Inc., 489 Fifth Ave., New York, has published a catalog on its Atmotrol products. This company is the factory representative for Julien P. Friez & Sons' instruments and controls; Waterloo Register Company's air conditioning registers; American Machine Products Company's blower-washer units, and Eclipse Aviation Corporation's air conditioning equipment. The catalog is standard size and gives complete information on those companies lines of products.

Alexander Brothers, Inc., 406 North Third St., Philadelphia. A pocket size catalog, No. A-49, entitled "Leather Packings"; 24 pages.

Bailey Meter Co., Cleveland. A 16-page bulletin No. 83, entitled Bailey Feed Water Regulators. Deals with thermo-hydraulic feed water regulators, lists distinctive features, diagrammatically illustrates the principle of operation by the thermo-hydraulic generator, and describes Bailey regulating valves of both tight seating and sleeve type construction. Data on excess pressure valves are also included. Contains a tabulation of valve dimensions.

Bell and Gossett Co., 3000 Wallace St., Chicago, has published a design manual for forced circulation hot water heating systems. The instructions contained in this 20-page book are simplified into six steps, easy to read and apply. In addition to the six-step method, there are included tables of heat loss coefficients.

Binks Manufacturing Co., 3106 Carroll Ave., Chicago. An eight-page bulletin on indoor forced draft spray cooling towers presenting information about constructional features, picturing a number of installations, showing typical arrangements, and giving size and capacity data and specifications. Also an eight-page bulletin devoted to atmospheric spray cooling towers for air conditioning and refrigeration, with complete engineering information and other data.

The Brown Instrument Co., Wayne and Roberts Aves., Philadelphia. A standard size folder briefly describing the advantages of using the company's instruments in boiler room and plant processing.

The Bryant Heater Co., 17825 St. Clair Ave., Cleveland. A catalog dealing with the company's line of heating, ventilating, and air conditioning equipment entitled "Comfort is in the Air." Describes the company's winter air conditioner, humidifier, Dualator, and gas boilers. Standard size; 12 pages.

Coppus Engineering Corp., Worcester, Mass., has published F 320-3, describing the Coppus unit type filter for motor and generator intakes, and general commercial and industrial ventilation. The other, No. F 310-2, contains complete data on filters for air compressors, internal combustion engines, etc. Sizes, shapes, and capacities of filters are given in tabular form.

Fedders Manufacturing Co., Inc., 57 Tonawanda St., Buffalo, N. Y. A looseleaf, standard size booklet entitled "Air Conditioning—Cooling and Dehumidifying Coils," explaining how the company has put cooling and dehumidifying coils on a package merchandising basis. It shows a variety of sizes and capacities to simplify coil selection and gives complete engineering data on the complete line. A psychrometric chart and other charts are included. The coils are available in 75 capacities for condensing units of 1 to 100 hp., and are manifolded for each row of tubing.

General Plate Co., 33 Forest St., Attleboro, Mass. A handbook on Truflex thermostatic bimetal. Sums up and presents in concise, usuable form, facts about all types of bimetal. Contains charts for calculating the proper bimetal elements to accomplish desired results. One section offers suggestions on how bimetal may be used to give new sales appeal to products. Standard size, 20 pp.

McLeod & Henry Co., Troy, N. Y. A catalog which describes the company's line of steel mixture furnace lines and apparatus. Standard size and contains 22 pages. Is profusely illustrated and contains detailed drawings and information pertaining to the construction and installation of the company's refractories.

Republic Steel Corp., Central Alloy District, Massillon, Ohio. A standard size, 16-page booklet containing the latest data on the various members of the Enduro 18-8 family of stainless steels. The booklet is well illustrated, includes a table showing the degree of corrosion resistance exerted by the company's stainless steels in the presence of several hundred chemicals, solutions, and other reagents. The booklet is designated as No. 125-A.

Shaw-Perkins Manufacturing Co., Oliver Building, Pittsburgh. A 20-page standard size catalog entitled "Modern Radiation." The first section is devoted to material on the Shaw convector-radiator designed for offices and similar installations, while the second section describes the company's Perkins convector-radiator, an industrial heating unit for high or low-pressure steam or forced circulation hot water. The catalog gives complete engineering information regarding these units, including dimensional and rating data, water friction through the radiators, piping connections, and heat emission.

B. F. Sturtevant Co., Hyde Park, Boston, Mass., has issued catalog No. 271-1 entitled "Multivane Fans Design 6." This catalog consists principally of performance and dimension tables, but also includes illustrations of the complete fans and component parts, and a list of installations and similar information. Standard size, 44 pages.

The company has also published a similar catalog, No. 331-1, entitled "Silentvane Fans Design 5," containing material similar to Catalog 271-1 except that it covers the Silentvane line. Also standard size, 68 pages.

Tube-Turns, Inc., 485 South Fifth St., Louisville, Ky. A bulletin dealing with design of modern industrial piping systems. Of particular interest is the method illustrated for determining the most economical pipe sizes and the amount of frictional resistance in straight pipe and bends. Included are a number of charts for figuring correct pipe sizes and pressure drop. The charts are drawn up so that the most economical pipe size and amount of pressure drop can be read directly. Data cover flow of fuel oils, lubricating oils, cotton seed oil, water, brine, gasoline and ammonia at temperatures ranging from — 20° to 400°, and steam, air, oxygen, nitrogen, hydrogen and ammonia at temperatures from — 100° to 1200°.

L. S. Wing Mfg. Co., 154 West 14 St., New York, has reprinted a technical article entitled "The Possibility of Reducing Maintenance Costs Through Fuel Used." This article, which recently appeared in a national magazine, caused such interest that its author, A. E. Seelig, president of L. J. Wing, had it reprinted in pamphlet form. It describes how cheaper fuel can be substituted in many cases for the more expensive form and with more beneficial results in the heating plant.

SARCO

Radiator Traps and Packless Inlet Valves In Florida

ANOTHER monument to the good judgment and ability of Wm. B. Ittner, M. Leo Elliott, Associate Architects, is the St. Petersburg (Fla.) High school illustrated, which is equipped with Sarco Radiator Traps and Inlet Valves.

That in schools, too, Sarco heating equipment has been found most efficient is shown by the fact that in New York City Sarco Heating Systems went into all but two of the schools included in a $20,273,521 budget; that in Savannah (Ga.) every school erected in four years was Sarco equipped, and that a large percentage of the better schools in most cities have adopted "Sarco" as the standard.

A dependable product is never the result of guess work—it is invariably made by someone who knows how. Which is why "Sarco" is a name that ends all questions about quality and dependable performance.

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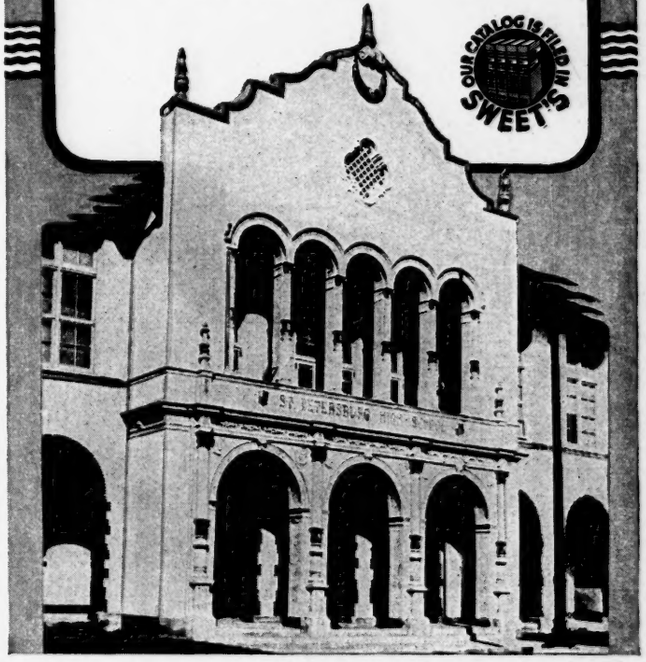
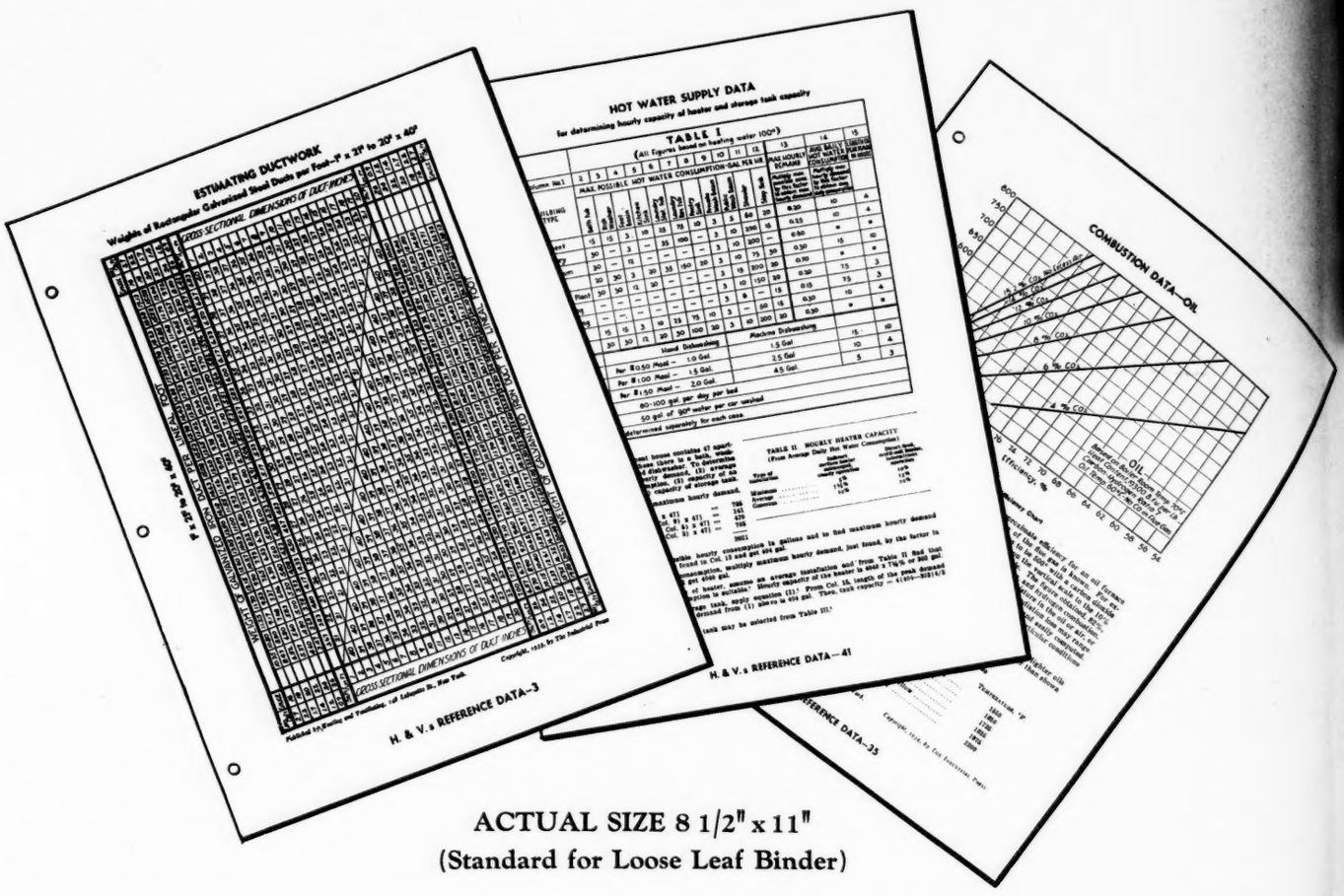


In This Issue—*and in*

USEFUL DATA SHEETS FOR YOUR



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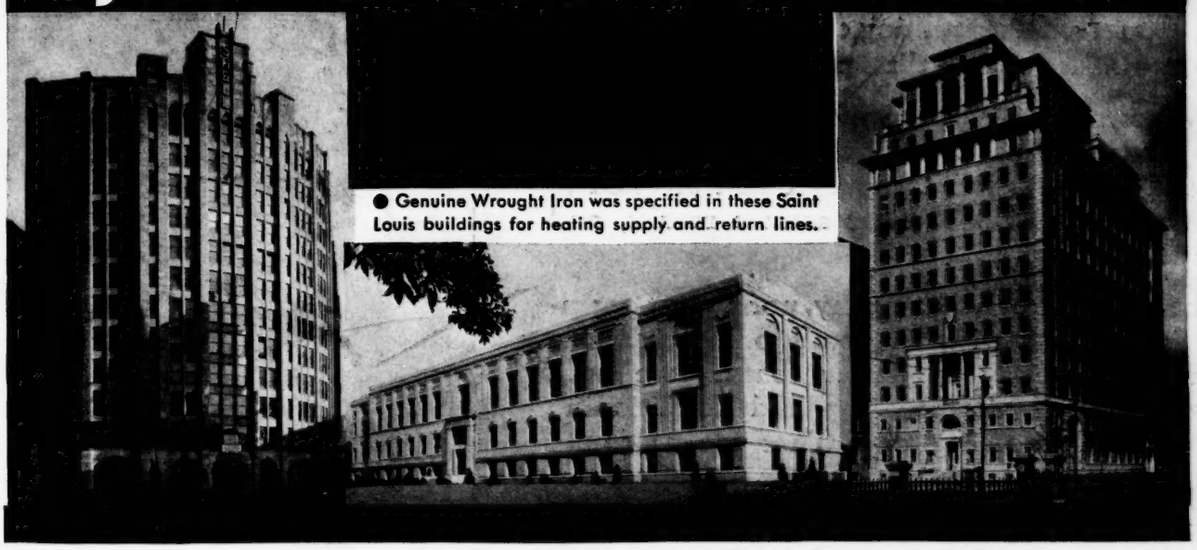
Service Records SHOW WHERE TO SPECIFY *Wrought Iron*

JAMIESON & SPEARL



● Genuine Wrought Iron was specified in these Saint Louis buildings for heating supply and return lines.

ACCORDING to leading architects and engineers, selection of the right pipe for each building service is just as important as good design. Pipe service and conditions differ—no one pipe material will fit all conditions. Substituting some other material for the job wrought iron has done so well for years has proved an expensive mistake.

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Illustrated are a few fine St. Louis buildings — examples of pipe selection based on service records. We call it "Pipe Prescription."

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